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The Electronic House Call is an innovative health care alternative for patients requiring frequent health care services that have been traditionally provided in a hospital or other clinical setting. The Medical College of Georgia Telemedicine Center, Georgia Institute of Technology Bioengineering Center, Jones Intercable, Inc., and the Center for Total Access at Fort Gordon have worked cooperatively to implement a cable-based "proof -of-concept" telemedicine system for delivering medical care to the homes of selected patients in the Augusta and Fort Gordon, Georgia area, and to the residents of a skilled nursing facility. Data has been collected regarding the technical performance of the system. System effects on patients and providers also have been collected, resulting in a successful demonstration of the concept.

In addition, Eisenhower Army Medical Center (EAMC) has become linked to the fiber-optic-based Georgia Statewide Academic and Medical System (GSAMS) Network. The capabilities of the Electronic House Call have been demonstrated to an audience in Washington, DC through a professionally composed videotape and through a live demonstration in April 1996. At the close of the project, extending the distribution of Georgia's statewide telemedicine system through the addition of PC-based teleconferencing and still image systems was under development.

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FOREWORD

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[signature] 11.13.96

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A DUAL USE TELECOMMUNICATIONS SYSTEM FOR DELIVERING MEDICAL CARE: Final Report

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Abstract

The Electronic House Call is an innovative health care alternative for patients requiring frequent health care services that have been traditionally provided in a hospital or other clinical setting. The Medical College of Georgia Telemedicine Center, Georgia Institute of Technology Bioengineering Center, Jones Intercable, Inc., and the Center for Total Access at Fort Gordon have worked cooperatively to implement a cable-based "proof-of-concept" telemedicine system for delivering medical care to the homes of selected patients in the Augusta and Fort Gordon, Georgia area, and to the residents of a skilled nursing facility. Data have been collected regarding the technical performance of the system. System effects data on patients and providers also have been collected, resulting in a successful demonstration of the concept.

In addition, Eisenhower Army Medical Center (EAMC) has become linked to the fiber-optic-based Georgia Statewide Academic and Medical System (GSAMS) Network. The capabilities of the Electronic House Call have been demonstrated to an audience in Washington, DC through a professionally composed videotape and through a live demonstration in April 1996. At the close of the project, extending the distribution of Georgia's statewide telemedicine system through the addition of PC-based teleconferencing and still image systems was under development.

Introduction

The necessity for containing costs is manifesting itself across all Federal programs, but nowhere is its impact more pronounced than in the area of health care. According to the Health Care Financing Administration (HCFA)[1], national health expenditures were $51 billion in 1967, 6.3 percent of the gross national product. By 1995, these expenditures had increased to $248.9 billion or 16.4 percent of the Federal budget. On a "per person" basis, national health expenditures increased from $247 in 1967 to $3,510 in 1994. Benefit payments to Medicare skilled nursing facilities grew from $7.1 billion in 1994 to $9.1 billion in 1995, an increase of 28.2 percent in one year. Similarly, benefit payments to Medicare home health agencies grew from $12 billion in 1994 to $15.1 billion in 1995, an increase of 25.8 percent in one year.

Efforts to contain or reduce these costs are driving the development and implementation of fundamental changes in U.S. health care programs. A key feature of these changes is innovation in the delivery of medical care. In many cases, innovative concepts are requiring radically different approaches to care and delivery -- approaches that are requiring patients, care providers, and communities to adopt a new paradigm for receiving and delivering care. A feature common to many of these new paradigms is the use of advanced technology. In fact, new technologies in areas such as computers, telecommunications, diagnostic sensors, electronic networks, data compression, etc. are emerging at an extremely rapid rate. Further, technologies in these separate areas are being combined in ways that offer significant cost reduction possibilities for the new health care delivery concepts. An excellent example of this is a concept, sometimes referred to as the Electronic House Call[2], in which telemedicine units are used to deliver health care directly to patients in their homes and/or nursing homes. Multiple home-based units, each consisting of an interactive, patient-friendly computer interface and an array of easy-to-use diagnostic devices, are linked via any one of several wired or wireless pathways to a single monitoring unit at a medical center. Care providers staffing the monitoring unit are able to not only reliably diagnose and monitor a wide range of patient illnesses, but also to provide wellness information and crisis intervention, without requiring patients to leave their homes or nursing homes. In the future, the home-based telemedicine unit may be integrated with other electronic units in the home or nursing home, creating a multi-functional home electronic system whose two-way audio, video, and data capabilities deliver a wide variety of medical, entertainment, and educational services to tomorrow's citizens.

Background

In order to ascertain the role of telemedicine in developing integrated health care systems, including hospitals, nursing homes, and home health care, a review of the literature was completed. This review placed particular emphasis on the delivery of home-based care through electronic means. **The entire literature review including bibliographic citations is included as Appendix A.**

Salient findings from the literature are as follows:

- For many individuals with chronic illnesses and disabilities, the provision of long term care has been uncoordinated, fragmented, and inefficient.
- Quality and access in nursing home care remain unsatisfactory.
- Nursing homes continue to be a leading source of rising health care costs.
- Health care policy efforts to integrate acute and chronic care sectors have been stymied by the fragmented nature of the larger health system.

- Patient transfers between home, nursing home, and acute care center have received increased attention because of the high costs involved.
- Development of near-acute care provided in nursing homes and homes of individuals is needed to reduce the costs of unnecessary acute-care.
- Telemedicine has the potential to be a "reasonable start" in the connection and integration of acute-care providers, nursing homes, and individuals in their homes.
- Trends in the nursing home industry are affecting nursing home structure and patient care:
  1. Long-term care organizations are becoming more integrated with acute-care providers,
  2. Level of need in nursing homes is rising, and,
  3. There is increasing specialization in nursing facilities.
- In both nursing home and home-based settings, telemedicine has the potential of improving continuity and coordination across the acute and chronic care sectors.
- In particular, telemedicine has potential for reducing patient transfers between care settings.
- Three factors (clinical, structural, and interpersonal) contribute to inappropriate transfers.
- An early study of telemedicine[3] provided evidence that telemedicine can improve patient care and reduce hospitalizations in a nursing home setting.
- The potential contributions of telemedicine fall in four broad areas: improving training, eliminating the distance barrier, reducing nursing staff burden, and improving communication.
- Home-based telemedicine offers chronically ill "revolving door" patients who frequent the emergency room and hospital a convenient and readily available resource to receive much of their needed care in the familiar surrounding of the home and reduces the patient's sense of isolation.
- Providers are able to gain a better understanding of the patient's home life through home-based telemedicine.
- Because home-based settings are a less expensive locus of care, home-based telemedicine may reduce costs.
- Home-health services should be targeted to individuals who are most at-risk for institutionalization.
- If home-based telemedicine is to succeed, issues of targeting and screening patients must be resolved, in addition to a range of organizational and technical issues.

Scope

In order to define the scope of the project an evaluability assessment was undertaken to frame the research questions. This led to the identification of research methods appropriate for the ultimate summative evaluation to be conducted in subsequent stages of this or other projects of a similar nature. Stakeholders in the Electronic House Call Project were identified by project officers. A total of thirteen individuals representing the Center for Total Access, Fort Gordon, Fort Detrick, Georgia Institute of Technology (GIT), and the Medical College of Georgia (MCG) were interviewed in order to determine the range of opinions regarding the evaluation of the project. **The entire evaluability assessment is included as Appendix B.** Salient findings are described as follows:

Research Questions That Respondents Would Want the Evaluation to Answer

1. What are the patient and provider attitudes and perceptions?
2. What effect does the use of the Electronic House Call have on health care and the utilization of services?
3. What is the technical and clinical reliability?
4. What is the project's impact on client health?
5. Is the Electronic House Call cost-effective?
6. What process of research (including cultural changes) is required for success among providers and among institutional partners?
7. How will the use of the Electronic House Call effect ethics in telemedicine?

Development of the Steering Committee

Through the summer and early autumn of 1995, project partners Medical College of Georgia, Georgia Institute of Technology, and Eisenhower Army Medical Center, became increasingly concerned, individually and collectively, that lack of centralized leadership was resulting in un-coordinated activities by project participants. Undefined responsibilities and resulting lack of personal and/or institutional ownership of tasks contributed to delayed resolution of conflict and inadequate focus on the parallel, sequential, and interdependent steps necessary to bring the project to a successful outcome. Therefore, a steering committee was formed on 19 October 1995 with balanced representation from the three collaborating institutions:

MCG: L.N. Adams, R. K. Grigsby, D. Rahn, M.E. Stachura
GIT: M. Burrow, J. Peifer, J. Toler
EAMC: B. Blakeslee, J. Horner, D. Ward (later replaced by L.Schlachta)
Ex officio: J. Sanders

James Toler was elected Steering Committee Chairman for a period of one year. Project tasks were identified and divided into four interrelated categories. Subcommittees were formed to assume direct responsibility for those tasks: Technical, Clinical, Operations/Administration, and Research/Evaluation. Steering Committee members were distributed on the subcommittees according to expertise and interest; subcommittee membership was supplemented by faculty/staff who would be involved in the relevant tasks from each of the collaborating institutions.

The Steering Committee has proven to be an effective and efficient mechanism for coordinating activities among the four subcommittees and three institutions, for identifying and resolving problems or conflicts, for reviewing progress as well as meeting time lines, and for assigning clear responsibilities. **Subcommittee Assignments and the Minutes of all Steering Committee Meetings are included as Appendix C.**

BODY

Task completion

The Statement of Work in the proposal indicated that several short term tasks would be completed. Each of the tasks is described and is followed by a description of progress to date for the individual tasks.

Task 1: Link Eisenhower Army Medical Center and Georgia Statewide Academic and Medical System

Cooperation between Medical College of Georgia Telemedicine Center and EAMC resulted in the following:

1. Selection and modification of a telemedicine room,
2. Hiring of a full time Telemedicine Coordinator at EAMC,
3. Installation of telemedicine lines and equipment,
4. Testing of equipment, and
5. Training of personnel in technical and operational aspects of the Georgia Statewide Telemedicine Program.

This was accomplished during the summer of 1996 , at which time Eisenhower Army Medical Center became ready to perform telemedicine consultations.

Task 2: Proof-of-Concept and System Demonstration

The major portion of work associated with this project was completed as the Electronic House Call System was developed, demonstrated, and evaluated.

System development and performance

The technical goal of Task 2 was to develop a stand-alone telemedicine system and associated network for monitoring the health of home-bound patients via telecommunications links. The system had to allow patients to communicate audiovisually with a medical care provider as well as perform unassisted diagnostic measurements. The aforementioned Technical Subcommittee formulated an approach for meeting the challenges of this task early in the project. This approach consisted of the following tasks:

1. Define system requirements for monitoring patients at home.
2. Perform an extensive survey of commercial telemedicine/teleconferencing systems and diagnostic devices to identify existing technology that can meet the needs of the project.
3. Formulate and implement a network plan to link patients with medical care providers.
4. Modify an existing system or develop a telemedicine system for home monitoring.
5. Install systems in the homes of 12 patients and a nursing home and evaluate performance.
6. Modify the system based on feedback from evaluations.
7. Install modified system in the homes of 13 additional patients.

These tasks were completed over a period of months. Throughout the process, data were collected by the nurse clinicians that tracked progress. When the project ended data were aggregated and analyzed. This result was a Proof-of-Concept and System Demonstration that included system requirements, a survey of medical diagnostic devices available, network development, hardware development, software development for both the patient monitoring station and the central monitoring station, and a database. The Proof-of-Concept and System Demonstration was predicated upon an in-depth technical review of home health care telemedicine systems. Documentation of the performance within each of the households, nursing home, and central monitoring station was kept throughout the development process. **The entire Proof-of-Concept and System Demonstration is included as Appendix D. In-home equipment list and unit-cost breakdown for the Electronic House Call is included as Appendix E.**

Clinical Protocols

The clinical goal of Task 2 was to prove that the concept of delivering home-based care through telemedicine was viable through an actual demonstration of the concept in the naturalistic setting of patient homes, a nursing home, and a tertiary care facility. The Human Assurances Committees at the Medical College of Georgia, Eisenhower Army Medical Center, and at the United States Army Medical Research Acquisition Activity at Fort Detrick approved the demonstration and work commenced. In order to begin the proof-of-concept and system demonstration, the Clinical Subcommittee of the Steering Committee developed a set of clinical protocols for use with the Electronic House Call delivery system. Patient histories, the nature and duration of the presenting problems, the history of present illnesses, the past history of the patient (psychosocial), and physical examination findings were supplemented by patient protocols written for assessing cardiovascular functioning, economic status, EENT functioning, endocrine functioning, environmental conditions, family functioning, functional behaviors, gastrointestinal functioning, hematologic functioning, integumentary status, musculoskeletal system functioning, neurological functioning, psychosocial status, pulmonary functioning, renal/urinary functioning, and reproductive system functioning. Clinical protocols were used for both the home-based and nursing home based care. **All Clinical Protocols for Electronic House Call use are included as Appendix F.**

System Evaluation

The evaluability assessment indicated that a number of answers to questions were sought. While a number of the questions dealt with the technical aspects of the project, questions about the effect of the Electronic House Call on patients and providers also need to be answered. Perceived effects on the process of care, especially from the users of the system (patients and providers) point of view are important as they can lead to the generation of hypotheses that can be refined and ultimately tested in a more extensive summative evaluation research framework.

Formative Evaluation

Interviews with patients (using the system)

During the first two weeks of October 1996, patients that had made use of the Electronic House Call were interviewed. Of the twenty-five patients served by the Electronic House Call, 13 patients were interviewed. The grandmother of one of the patients was also interviewed, as this child has not yet become verbal. These fourteen patients represent 56% of the patients served in the project. Eleven households are represented in the sample of patients. The decision to interview patients was based upon the availability of the patient, the patient's desire to participate, and the level of functioning (as best known). Other family members were not excluded from sitting in the room with the interviewer, but the focus of the interview was on the patient. Nursing home and hospitalized patients were not interviewed. All of the interviewing took place in the homes of the patients.

The interviews were unstructured to the greatest degree possible. A doctoral level researcher with extensive experience in interviewing persons in home and community settings made arrangements to go to the homes of patients in order to interview them. In arranging the interviews and in introducing the interviews, the patients were told that they would be asked to meet with the researcher in their home and to tell about their experience with the Electronic House Call. In some cases, the researcher was accompanied by an assistant (who had arranged

the interviews) who introduced the researcher and who took notes. All of the interviews started with the general, open-ended question of "What can you tell me about the Electronic House Call?" As the patients described their experiences, the researcher offered little more than prompts such as "Tell me more" or "What else can you tell me?" The interviews concluded with the question "Is there anything else you can tell me about the Electronic House Call?" All of the interviews lasted about 30 minutes. None of the interviews was less than 20 minutes in length. The interviews were not electronically recorded in order to facilitate open and frank discussion. No patient expressed any reluctance to participate to the researcher.

Emerging hypotheses

Field notes were kept from the interviews with persons in the eleven households. After all of the interviews were completed, the Field notes were analyzed through the use of the "constant comparative method" as described by Glaser and Strauss[4]. The constant comparative method combines coding procedures with analytic procedures so that hypotheses might be "discovered" in the process. This was accomplished by reviewing field notes and categorizing explicit verbal statements of the interviewed patents. As salient themes emerged in the review of Field notes, they were compared to the themes uncovered in the review of field notes from other cases. Ultimately, a number of categories common to many of the cases were uncovered. Nine of the eleven households reported that they had a positive experience with the Electronic House call. This was generalized under the category of "positive regard". Patient's statements such as "I like it", "I enjoy it", and "It's a marvelous machine", and other statements that exemplified a positive experience with the Electronic House call were included in this category.

Patients in eight households reported "social interaction" as result of their participation. Verbal statements such as "I get to see Debbie (nurse) and talk", "I met some nice people through it", and other statements related to interacting with others via the Electronic House call equipment. Similarly, patients in eight of the households discussed their own health and medical problems. This information was not solicited by the interviewer. Rather, patients brought up this topic spontaneously in statements such as "I have a lot of medical problems that don't show" and "I can't walk too good" were categorized as "concerns with health". Patients in seven households described "other persons' reaction or response" to the Electronic House call. Statements such as "my daughter is an RN. She thought it was great . . .", and "compared to their computers, its a marvelous piece of equipment," everyone is fascinated with it" were captured under this category. Patients in six of the households had something to say about the "chair" that was used with the system. This was closely related to another category labeled as a "lack of easiness in using" the Electronic House Call where patients in six of the households offered statements such as "it would be better if it were easier to use", "have trouble getting the measurements", "complicated to get going", and "they have been having problems with it". Comments related to the use of a chair described difficulty. "You need a rolling chair and someone else to move a handicapped person", was the response of one patient. Another patient that lives in a personal care home, reported not having a chair at all at the outset of project. He reported "Debbie (nurse) dug up a big'ol chair and brought it out to me". A wheelchair bound patient reported that she was able to "adjust myself but it's an inconvenience . . . I get up there and do what I do. If I fall, I don't have any help".

Patients in three households reported feelings of "reassurance" as part of their experience with having the Electronic House Call in their home. Patients in two households reported that they were "fascinated" or "in awe" of the Electronic House Call. Patients in individual households mentioned that they "wished it could call 911", that they had "emergency access" to immediate help through the Electronic House Call and that they wished that the Electronic House Call could monitor "blood sugar and cholesterol".

These themes led to the generation of the following hypotheses:

1. Patients have positive regard for the Electronic House Call.
2. Patients have increased social interaction through the introduction of the Electronic House Call into their lives.
3. Patients are concerned with their own health and well-being.
4. a. The level of difficulty involved in using the Electronic House Call presents problems for some patients.
   b. In particular, the type of chair or lack of a provided chair, increases the difficulty in using the Electronic House Call.
5. Patients are interested in the opinions of others related to the Electronic House Call.
6. The presence of the Electronic House Call helps patients to feel reassured.
7. Patients may be fascinated with or feel in awe of the Electronic House Call.
8. There may be other functions added to the Electronic House Call to improve its usefulness to patients.
9. The inclusion of immediate emergency availability is desired by patients.

As might be expected, interviewed patients spoke of many other ideas and experiences in using the Electronic House Call. Analysis of open-ended, home-based interviews has resulted in the development of several hypotheses. Several of these hypotheses should be tested through empirical research during the next phase of this project. It should be remembered that other hypotheses are likely to emerge as use of the Electronic House Call continues.

Interviews with care providers (nurses and physicians)

At the outset of the project, three registered nurses were hired to work with the Electronic House Call project as clinicians that would see patients involved in the project. Each of the nurses was interviewed in an open-ended interview that took place during early October, 1996. All of the interviews took place on the Medical College of Georgia campus at the Telemedicine Center offices. Each of the nurses was individually interviewed by the same doctoral level researcher that conducted the patient interviews. None of the interviews was longer than 45 minutes or shorter than 30 minutes. Interviews began with the researcher requesting that the nurses "tell me about your experience with the Electronic House Call". As the nurses described their experiences, the researcher offered little more than prompts such as "Tell me more" or "What else can you tell me?" The interviews concluded with the question "Is there anything else you can tell me about the Electronic House Call?" Field notes were taken during the interviews so that they could be reviewed, compared, and contrasted using the methods described in the section above.

Emerging hypotheses

All of the nurses began their responses with statements of "positive regard" such as "I've enjoyed it. It has given me new ways to provide home care", "It's been fun", and "I think that

it is very useful when applied to the right patient". Each of them quickly qualified their statements of positive regard with statements describing their "frustration" with the project. It is important to note that the expressed frustration was related to the unreliability of the Electronic House Call, especially during the early weeks of operation. Frustration with "tedious paperwork" related to the study was also openly expressed. In fact, two of the nurses expressed that electronic means of data gathering should be developed. All of the nurses also expressed frustration with the peripherals involved. The lack of accuracy of the scale, the poor quality of sound via the stethoscope, and the lack of glucose monitoring were all mentioned as having room for improvement.

All of the nurses also discussed the "relationships with patients" that they had developed, although not all of the statements were positive. The nurses all expressed that they had gotten to know their patients in different ways than if they had seen them in a typical home-health approach. One nurse described it aptly as "I've gotten to know their families and family dynamics. At first when I heard telepsychiatry, I thought it was off the wall. Ninety-nine percent of what I have done has been some form of psychiatry. I see more of a need for a program just to touch base with persons". Another nurse reported "I haven't had the best of experiences - haven't had the best patient". On the other hand, another nurse reported that "patients who have been difficult at home seem to be more cooperative over the EHC. Patients say that they feel more independent and that they can care for themselves".

All of the nurses mentioned that they felt that the Electronic House Call has helped them to be more "efficient", or that it helped them to maintain their efficiency. However, one nurse reported that having to leave her usual practice site in order to go to the Central Monitoring Station has been a problem. Two of the nurses expressed that they felt the Electronic House Call was better suited for patients that were less well. In effect, they suggest that more mobile patents are more problematic in that they are less easy to schedule. One nurse explained: "The patients that I have - a good portion - are mobile. In one way it's bad because sometimes my patients are not anywhere to be found". Statements related to this problem are grouped in the category of "mobility issues".

While the nurses spoke about many other topics, the themes described above emerged as their statements were compared and contrasted. The analysis of the interview field notes leads to the following hypotheses:

1. Nurses, like patients, have positive regard for the Electronic House Call.
2. Nurses felt some degree of frustration in working with the Electronic House Call.
    a. Frustration was related to the tedious paperwork in the data collection process.
    b. Frustration was related to difficulty in using existing peripherals or in not having desired peripherals.
3. Nurses develop relationships with the patients served via the EHC.
4. Nurses feel that their efficiency is effected positively by the Electronic House Call.
    a. Less mobile patients are easier to serve via the Electronic House Call.

As might be expected, the nurses spoke of many other ideas and experiences in using the Electronic House Call. Analysis of the interviews has resulted in the development of several hypotheses. Several of these hypotheses should be tested through empirical research during the next phase of this project. It should be remembered that other hypotheses are likely to emerge

as use of the Electronic House Call continues.

Participating Medical College of Georgia physicians were interviewed by the Clinical Director of the MCG Telemedicine Center. These interviews took place via telephone during the final month of the project. Field notes were kept on each interview. The shortest interview was of twelve minutes duration and the longest was 30 minutes, with the typical interview lasting for approximately 20 minutes.

While comments from patients and nurses were typically positive, the physicians were much more cautious and/or tentative in their responses. Although one respondent replied that the system was a wonderful service for patients to provide monitoring and management, the response was quickly tempered with the statement that the availability was too restrictive. Other respondents reported that they were uncertain of the reliability of the system, that they found the limited availability of their own time to be restrictive to participation, that the available measurement parameters were very limited, and that the quality of the connection was too often substandard. It is important to note that physicians were not the typical point of contact for patients via the system. Patients typically were seen by the nurses.

This appears to lead to one striking hypothesis:

- Physicians utilizing the Electronic House Call system see the system as having limited capabilities and utility in its current configuration. Practical utility will require additional measurement parameters and round-the-clock support of clients.

Human assurances and FDA regulation issues

During the initial months of the project, no patients were seen as the time was spent developing the technical aspects of the system. In fact, approval for seeing patients was not sought until after the project reached the point where viability was imminent. On March 22, 1996, the MCG Human Assurances Committee granted approval that allowed for the use of the Electronic House Call with human subjects. Informed consent was obtained from patients and the installation of Electronic House Call equipment commenced. In light of the fact that all of the medical equipment used in the system (pulse oximeter, blood pressure cuff, etc.) was current off-the-shelf (COTS) technology, separate approval from the federal Food and Drug Administration (FDA) was not necessary, although contact was made with that agency in order to ensure that all appropriate guidelines were being met

Use of the system

Following the initial development of the Electronic House Call, actual connections with patients began to take place. Although equipment was installed in some homes during the early part of 1996, successful connection between the home and the central monitoring station was often interrupted by technical problems. Eventually, successful connections became commonplace. In order to more fully explore the capabilities of the system, a no-cost extension of the project was requested and approved, allowing further demonstration of the system. Records were kept of every attempted connection. Connections were described as "successful" if two-way audiovisual contact was initiated and subsequently maintained between the central monitoring station and the household. "Successful connections with problems" were recorded when a successful connection was initiated, but a break in communication took place (either audio, visual, or both). Problems with the network, the central monitoring station, the patient monitoring station, audio delivery, video delivery, and with the measuring devices (blood

pressure, pulse oximetry, stethoscope, temperature probe, EKG) were individually recorded, as was patient unavailability. Descriptive statistics regarding data related to problems of these types were kept and are included in the Appendix. As this is a feasibility study, inferential statistical analysis has not been performed.

The number of days equipment remained in the homes of patients ranged from one (1) to 230 days, with the mean number of days being 94 (94.48). The number of connections attempted ranged from one (1) to 80 with the mean number of successful connections between a household and the central monitoring station being 18 (17.64). For successful connections, the time of connection ranged from about one minute to 69 minutes, with the mean duration of connection being 12 minutes. All of the measuring devices (blood pressure, pulse oximetry, stethoscope, temperature probe, EKG) were used. Minor problems were experienced with each of the devices, and the EKG was seldom utilized. A patient-by-patient, encounter-by-encounter, log of successful connections which includes notes on the use of the measuring devices and notes related to specific problems was kept for the duration of the project. Based upon these data, the feasibility of the Electronic House Call has been adequately demonstrated at this level. Testing, especially as related to clinical objectives, should be continued in order to more carefully assess the reliability of the system. **System use details (including case-by-case and aggregate data) are included as Appendix G.**

Task 3: Videotape and Demonstration in Washington, D.C.

The development and distribution of a video tape that would clearly depict the concept of an electronic capability for delivering medical care directly to patients in their homes and in nursing homes was completed as part of this task. Primary audience members were congressional delegations and military personnel in leadership positions in medical commands. The secondary audience included upper-level managers in commercial telecommunications organizations, key officials in government biomedical research agencies, and persons attending health care conferences.

Initial efforts involved securing the assistance of TechVideo, the on-campus organization responsible for preparing video presentation for GIT. With TechVideo assistance, an overview of the tape was developed in a story board format that used a series of graphic depictions, explained by background audio, to describe the concept of an electronic house call. The graphic depictions portrayed a single, computer-based monitoring unit in a medical center linked via telecommunication pathways with computer-based diagnostic units in multiple patient homes and nursing homes. The background audio explained how reliable medical diagnoses would be made based on the two way exchanges of audio, video, and data information. The telecommunication pathways were shown as various wired and wireless links, with bi-directional coaxial cable available from local CATV providers as the link to be initially used in this project.

Once the story board overview of the tape was finalized, a script was developed for real-life scenes that would show implementation of the electronic house call concept. This script required actors and actresses in a representative medical center and patient home. The scenes depicted a scenario in which a medical professional at a medical center linked with a patient at home because diagnostic data routinely acquired off-line indicated an undesired increase in airway resistance. Two-way audio, video, and data exchanges during the linkage confirmed an increasingly serious medical situation. As a result, an increase in medication was ordered, thus

precluding a possible crises situation by the time of the patient's next scheduled office visit.

The story board presentation of the electronic house call concept and the script were then presented to, and approved by, the Steering committee. Arrangements were made for use of space in medical center and home, actors and actresses were hired, graphics were generated, a person to provide the background audio was hired, and the scenes were filmed by TechVideo. Graphics and background audio were then spliced into the film, resulting in video tape of approximately eight minutes duration. A master tape plus 12 copies were delivered. The master tape was provided to MCG, with copies distributed to members of the Steering committee and persons within the Army Medical Materiel Command.

Demonstration in Washington, DC

On April 1-4, 1996, members of the project staff from MCG and GIT traveled to Tyson's Corner, VA to participate in the conference titled "National Forum II: Global Telemedicine and Its Implications." Although this was only the second year in which this conference was held, a large number of military and civilian delegates attended the program of platform presentations and technology exhibits. This attendance was attributed to the fact that this conference provided an excellent opportunity to learn of military-oriented uses of advanced telecommunications in delivering improved medical care over large geographical areas.

MCG and GIT participation consisted of using acquired booth space in the exhibits area to demonstrate to conference attendees the capabilities of the electronic house call system developed under the Project. To conduct the demonstrations, a monitoring unit and a patient unit were transported to the conference and linked together in an operational configuration that included ISDN links to MCG and the Eisenhower Army Medical Center. This configuration was then used to conduct demonstration that showed how ISDN technology could be used to reliably monitor basic diagnostic parameters (blood pressure, blood oxygen, cardiac rate, EKG, weight, temperature, and cardiac/lung sounds) in remotely-located patients in their homes and/or nursing homes. Interest of both military and civilian attendees in the demonstrations was high over the three-day time period of the conference; therefore, the number of opportunities to demonstrate the ISDN version of the Electronic House Call concept was significant. As a result, a large number of persons, many in key leadership positions, were informed of the project and, in some cases, offered suggestions regarding capabilities needed in next-generation systems. This presentation was the first of several related presentations completed during the project. **A bibliography of publications and presentations is included as Appendix H.**

Task 4: Extend distribution through PC based systems

Attempts to link the Georgia Statewide Academic and Medical System (GSAMS) to the personal computer have been investigated throughout the duration of the project. Issues of the communication pathway, the communication rate, and the coding format must be resolved in order for a GSTP member site to communicate with a non-member site. The Georgia Department of Administrative Services provides a bridge, and two codecs to facilitate connections between sites. Any PC based video conferencing system that uses the FCIF (H.320) video conferencing standard and has either an ISDN communication interface of a serial interface such as X.21 linked to an inverse multiplexor, can connect. The Medical College of Georgia Telemedicine Center has purchased an inverse multiplexor for use in the laboratory to develop a direct digital gateway between GSAMS and switched-56. In Phase II development,

plans call for the installation of an ISDN-Pri line in the laboratory to provide a PSTN equivalent to T-1 for further evaluation of universal access to GSAMS sites by personal computer based systems such as the Electronic House Call. **More complete information regarding Task 4 is included as Appendix I.**

Clinical Objectives

Although clinical objectives were an original goal of the project, the funding of the Electronic House Call as a one year feasibility study precluded the development of clinical objectives. Continued testing will be necessary in order to carefully assess the reliability of the system prior to its actual use in the provision of health care.

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CONCLUSIONS - Rashid Bashshur, Ph.D.

Introduction

The executive summary for this report is presented elsewhere, and the following remarks are not intended as a summary of the results of the project. Instead, these are reflective remarks concerning the history and accomplishments of this project as well as the organizational and contextual issues that affected its performance. Many of these issues are not readily obvious and cannot be intuitively deduced from reading the final report or the executive summary. Nonetheless, they are important because they not only clarify the scope and organizational complexity of this project, but perhaps more importantly, they might suggest ways of improving or building on what was accomplished and continuing with the collaboration that was established.

Typically, the fairest measure of the success or failure of any project is the extent to which its objectives, whether implicit or explicit, have been realized within its budgetary and time constraints. Moreover, it is much easier and more accurate to make such determination when the objectives are stated explicitly at the outset, as was the case with this project, rather than being hidden or implicit. Hence, the task of assessing the relative success of the Electronic House Call (EHC) project (formally referred to as the Dual-Use Telecommunications System for Delivering Medical Care) in achieving its objectives should be rather simple and straightforward. Yet, in view of the complexity and evolving nature of the project, such assessment should be done with a great deal of care, lest its short term success create the impression that the work was done, and hence mask the need for continuing. Further, the assessment of the project should provide ample clarification of its organizational complexity lest we lose sight of some of the most important lessons to be learned from this effort. This clarification is not intended as preemptive to justify failure. To the contrary, the first year of the project produced tangible results that reinforced the merit of the concept of distributive telemedicine systems and the overall significance of the effort. Some of the lessons learned from the experience may appear tangential to the explicit tasks of the project during its first year. Yet, they pertain to fundamental issues of efficiency in organizing public/private partnerships, multi-institutional cooperation and multi-disciplinary teamwork as well as the design of technological requirements for effective home-based and nursing-home-based telemedicine systems. Moreover, they pertain to the critical problem of return on investment in designing integrated telemedicine systems for confined and institutionalized populations utilizing efficient mixes of high and low technology hardware and software, typically off-the-shelf.

A careful review of the main body of this report reveals that the tasks specified in the proposal and in the subsequent project plans have been successfully completed despite the usual delays and setbacks which were encountered along the way. Interestingly, the project scope, duration, and content have been changed substantially during a protracted funding/negotiation process to accommodate terms and conditions required by the US Army. Regardless of their merit, the changes that occurred along the way make it difficult now to determine whether the limited short term achievements of the project reflect the full potential that can be gained from the collaboration that was established. Stated differently, the more important question to be addressed now has to do with the merit of the project if it were to stop here and go no further. What definitive conclusions

can be drawn justifiably (or what specific gains were obtained) after only one year of operation in what was conceived of and designed as a multi-year project? Do the short term, or one year, objectives do justice to the larger effort? Indeed, if the project were to be concluded in one year, why spend the time and effort necessary to establish a multi-institution consortium and build bridges between academic and military institutions? Finally, if long term objectives could not be achieved during only one year in the life of this type of project, what significant insights can be gained from the experience regarding the organization and efficient management of large scale collaborative efforts involving civilian/military and public/private partnerships?

I will attempt to address these and related questions. I will attempt to do so systematically by: (1) reviewing the performance of the project in terms of explicit short term objectives in contrast to long term objectives; and (2) describing the structural and organizational problems encountered in implementing this project as well as the broader contextual issues that may have affected its performance.

Project History, Aims, and Objectives

The original proposal for this project aimed to establish a telemedicine consortium involving two academic institutions and an army medical center to develop, test, and evaluate an integrated and comprehensive telemedicine system. The system would serve a sizeable population of civilian and military personnel, as well as the civilian dependents of the latter, in the Southeastern region of the United States and Puerto Rico. The proposal called for the use of wired and/or wireless transmission modes to link geographically dispersed and institutionally confined patients with appropriate providers working in their offices or tertiary care centers. Both desktop and rugged portable platforms would be used for two-way interchange of audio, video, graphics, imaging and textual data in the provision of comprehensive health services. Hence, the proposed project would develop, design, test, and implement various technological configurations (or mixes of equipment), already available in the commercial market, for building distributive telemedicine systems for use in peace and wartime.

An especially attractive aspect of the original project and its subsequent transformations is the high quality and inter-relatedness of medical, health services, and engineering expertise among the consortium members. These members would collaborate to advance the overall vision for a reorganized and improved military medical care system and its actual implementation in one region of the country. The consortium consisted of the Medical College of Georgia (MCG), the Georgia Institute of Technology (GIT), and Eisenhower Army Medical Center EAMC) at Fort Gordon, later designated as the Center for Total Access (CTA). Each member brings a unique and significant dimension to the project. EAMC is the military care provider responsible for a total service population of about 1.3 million military personnel and their dependents throughout the Southeast and Puerto Rico. The Center for Total Access at EAMC would serve as the central or proximal facility for the regional effort to be undertaken over a five-year period. MCG is the coordinator and manager of the statewide telemedicine system of Georgia. By virtue of its experience and knowledge in health care and telemedicine, MCG has a strong capability in telemedical practice as well as health services research and evaluation of telemedicine. GIT is the technical designer. Its engineers provide technical direction and support in telecommunications, computer systems, signal processing, digital design and multimedia techniques.

From the military perspective, this project had several attractive attributes and no major drawback: (1) It would serve as part of a larger reorganization effort aimed at expanding the use of information technology in modernizing health service delivery to military personnel and their dependents during peace and military engagements. (2) It would offer a valuable opportunity to work jointly with two academic centers who are both heavily committed to telemedicine development and with a state government that (a) established the largest statewide network for telemedicine and distance learning in the United States and (b) is willing to match federal funds at least during in the initial stages of the project. (3) It would link an army medical center (as a hub) to an operational statewide telemedicine network (as its service area). And, finally (4) it would implement a Congressional mandate through the appropriate use of "set aside" budget allocation.

While this project was originally conceived of clearly as a five-year enterprise, the final proposal requested funding for only one year because of the inflexible nature of the Congressional appropriation. An amount of $1,000,000 was set aside for a joint GIT/MCG project involving the army. This made it necessary to approach the project in a staged sequential manner. The Congressional appropriation, subsequently matched by a State of Georgia appropriation, had the unintended effect of focusing on a limited set of objectives that can be completed within one year. In other words, the idea of planning for a one year project acquired a life of its own, even though project organizers tried not to lose sight of, or at least not violate, the long term objectives they were pursuing. Hence, it identified a specific set of limited tasks for the first year, together with a fixed budget, a fixed time frame and a defined set of deliverables. To make them credible, the short term objectives had to have sufficient merit on their own to justify both federal and state funding in the event that no further funding would be provided at the conclusion of the first year.

During the implementation of the project, the tension between the short term achievable objectives (things that can be completed within one year) and long term viable goals for the larger project (the more important outputs expected from this project) became a source of frustration for some of the participants in this project. More importantly, it created an imbalance between a complex decision making process and the need to achieve a limited set of objectives that do not require this level of complexity in decision making.

For the first year of the project, emphasis was placed on the following objectives: (1) to connect EAMC to the telemedicine portion of the fiber-optic Georgia Statewide Academic and Medical System (GSAMS); (2) to establish "proof-of-concept", or alpha testing, for a cable based telemedicine system linking (a) homes of selected military and civilian clients to a skilled nursing facility (b) residents of nursing homes to a skilled nursing facility and (3) to develop a kiosk-based demonstration of the project and present it in Washington DC. The last objective was in response to a specific request by the Army. These objectives were further translated into specific tasks and sub-tasks which are identified in the following section, together with a brief indication of their fulfillment.

° **Link EAMC to the fiber-optic-based GSAMS network.**

This task is rather straightforward, and it entails providing EAMC with the hardware and software to become a "hub" telemedicine center. Substantial progress was achieved in linking EAMC to the Georgia Statewide Telemedicine Program, including the installation of the lines and equipment, testing, and training of personnel in technical and operational aspects of the system.

° **Implement a cable-based "proof of concept" telemedicine system for delivering**

medical care to the homes of selected patients in Augusta, GA

Three sub-tasks were identified under this basic task: (1) to demonstrate within a quick time frame the concept that a configuration of off-the-shelf equipment can be linked via an existing cable television network to provide quality medical care between tertiary medical centers and patients in their homes; (2) to provide a continuous stream of hardware and software advancements into the system; these would include interface units, network linkages, electronic patient records, diagnostic devices, and back-packable systems; and (3) system evaluation.

Perhaps the most significant short term achievement is the design and testing of a complex cable based system using off-the-shelf equipment. It was important to design an "extremely user friendly" system to enable unsophisticated home-bound patients to use it effectively, and to design a system capable of operating over various telecommunications media, including POTS, CATV, and ISDN in a wired and wireless mode. Unavoidable delays occurred, and the system became operational toward the end of the funding period. System development and demonstration are described in the main body of the report. However, in view of the delay in getting the system operational the evaluation had to be curtailed to the minimal level. No systematic hard data are available to enable a meaningful evaluation of the system. Preliminary data from personal interviews suggest a very positive response on the part of the patients. The availability assessment (interviews with key stakeholders) revealed significant ways to improve the efficiency and effectiveness of the program in the future.

° **Develop and demonstrate the capabilities of a comprehensive telemedicine system to an audience in Washington, DC**

This task consists of the design, fabrication, and demonstration of an individual kiosk-type depiction of the program. A demonstration was made in Washington DC on April 1-4, coinciding with the National Forum II: Global Telemedicine and its Implications."

° **Extend the distribution of Georgia's statewide telemedicine system by adding desktop computer-based teleconferencing and still image systems.**

The original plan called for developing a detailed set of long term objectives at the conclusion of the first year of operation. However, since the future of this program is not yet certain, this specification has yet to be made. Moreover, since the project was unable to deliver care to patients on a reliable basis for an adequate period of time, no data have been gathered to evaluate its impact.

Despite initial technical difficulties in linking the Georgia Statewide Telemedicine Program to desktop computers, technical solutions were developed in the latter stages of the project to achieve such linkage. However, this was only demonstrated in a laboratory setting.

Organizational and Contextual Issues

As explained elsewhere in the Final Report in some detail, the Electronic House Call project was a collaborative initiative involving the Medical College of Georgia, the Georgia Institute of Technology, and the Eisenhower Army Medical Center (Center for Total Access) , three institutions with missions in health care delivery, education and research, and national defense. The mere convergence of the three institutions in designing, developing and deploying user friendly home-based telemedicine systems within the span of one year is an achievement in itself. The problem is the untimely termination of the effort. Indeed, the collaboration among academic institutions (one specializing in health care and the other in engineering) and the military should prove useful in

developing efficient strategies for dealing with complex chronic health problems via telemedicine. Collectively, the three organizations contain the technical expertise and tools necessary to continue with the task at hand to produce useful results for both the military and civilian sectors.

The first year effort was not without problems. The most significant immediate problems were technological in nature. Here, the attempt was to design a seamless efficient system using off-the-shelf components. Often, these components were designed for different purposes, and it was not easy to get the system working reliably in a short time frame. Delays in getting the system to operate reliably caused considerable frustration. More importantly, delays also resulted in scaling back on some of the original objectives, especially in the area of evaluation. Since the project was not fully operational at a steady state, it was not possible to collect reliable data to evaluate its true effects. Lacking such data, it was not possible to develop the summative evaluation design that was contemplated.

If the participants are viewed in terms of their roles (clinicians, engineers, managers) rather than their institutional affiliation (MCG, GIT, CTA), serious differences in perspective can be seen. The engineers, together with the cable company, did not have sufficient time to design, test, and deliver a composite cable-based telecommunications system. The clinicians were disappointed with the technical performance of the system the first few times they tried it; they were brought in prematurely to deliver clinical services before the system was operating smoothly. Similarly, the managers became impatient with a system unable to deliver its intended benefits in a timely manner, while unable to do much about it. Further confounding the situation, these roles overlapped with institutional affiliation, and hence, the different actors were also concerned about the institutional interests they represented. The military view tended to be more short term and technical, whereas the academic view was more comprehensive and long range. In other words, the military participants tended to consider this project as a discrete and finite effort, whereas the academic participants viewed it as part of a continuing effort that goes beyond the project's immediate objectives. These differences were not apparent to the participants at the outset.

Differences in culture (ways of doing things) among the participants became apparent, which were exacerbated by the collective leadership of the project. The representation of each of the participants was necessary in a collaborative effort of this nature. But, in view of the short term perspective of the project, a strong central leadership was needed to keep the project on course and to avoid distractions. A more efficient form of management may have been achieved by having a full-time professional manager for the project with sufficient authority to make important day to day decisions. The manager would report to the board representing the participants.

Finally, the potential benefits to be gained from the Electronic House Call project far exceed the difficulties encountered in a single year effort to get it designed, developed, and deployed. Important problems of cost, access, and quality of care continue to confront the health care system in the military and civilian sectors. These problems are among the most powerful pressures for system transformation. Distributive telemedicine appears to be a logical solution. Hence, more research and development work in this area is indicated.

Appendices A-K

Appendix A - Review of the Literature

Appendix B - Evaluability Assessment

Appendix C - Subcommittee Assignments and Steering Committee Meeting Minutes

Appendix D - Proof-of-Concept and System Demonstration Information

Appendix E - In-Home Equipment List and Unit-Cost Breakdown

Appendix F - Clinical Protocols

Appendix G - System Use Details

Appendix H - Bibliography of Related Publications and Presentations

Appendix I - Extending Distribution Through PC-Based Systems

Appendix J - Budget Summary

Appendix K - Personnel Listing

APPENDIX A

Introduction

One of the supportive tasks of this project was a review of the literature concerning nursing homes and home health care. The purpose of the review was to consider the role of telemedicine in developing integrated health care systems, encompassing hospitals, nursing homes and home heath care. However, much of this review will focus on nursing homes not only because the literature on nursing homes in much more extensive but, more importantly, because of the obvious potential of telemedicine for building institutional links between hospitals and nursing homes.

Nursing Homes and the Health Care System

The term "nursing home" refers to a wide range of facilities -- from three-bed family-owned homes to 20-bed units in acute community hospitals to 99-bed homes owned by corporations to 1,200-bed government-operated institutions (Evashwick and Langdon, 1996). In contrast to short-term acute care hospitals, nursing homes represent an extreme end of the continuum of institutional care, they provide health and social services as well as housing to their residents (Kane and Kane, 1987). The nursing home industry is in flux, and distinctions are blurring among nursing home care, home care, and other long-term care services Kane (1995).

For a variety of reasons, public and professional attitudes toward nursing homes have long been profoundly negative. Sometimes called "warehouses for dying" (Vladeck, 1980), they are widely considered a terminal, last resort health care destination. While such views exaggerate the finality of a nursing home admission (Weissert and Scanlon, 1985), their gloomy reputation is maintained by frequently scandalous care (Vladeck, 1980; Institute of Medicine, 1986), dehumanizing aspects of institutional living (Goffman, 1961; Gubrium, 1975), and the gulf which separates nursing homes from acute care providers.

Since the late 19th century, long-term and acute care services have been disconnected bureaucratically, physically, and professionally (Starr, 1982; Rosenberg, 1995). Also, until the 1980s, whereas physicians reigned supreme in hospitals (Freidson, 1970), nursing homes were isolated, closed dominions having little physician involvement (Vladeck, 1980; Institute of Medicine, 1986). Unlike acute care hospitals, nursing homes could not mandate physician participation -- physicians were more independent of nursing homes and the loss of admitting privileges might actually be seen as a relief instead of a burden (Miller and Barry, 1979).

Despite recent mergers of many health service organizations, creating large networks that encompass both acute care centers and long-term care facilities (Fennell and Alexander, 1993), the gulf between acute and chronic care remains largely un-bridged. Both public and private systems of health care financing have separated acute from chronic care. In the public sector, acute care services are funded by Medicare and managed by the federal government; whereas long-term care services are largely funded by Medicaid and managed by state governments (Weiner and Skaggs, 1995). In the private sector historically, insurers have been reluctant to offer long-term care insurance because of a perception that it is not an insurable risk, i.e., not precisely defined or predictable (Donabedian, 1976). Such fragmentation in funding has tended to reinforce a fragmentation of care (Kane and Kane, 1987).

Perhaps more fundamentally, divisions between acute and long term care have resulted from the very structure and character of the American medical system -- in particular, the medical profession's curative focus and its selective attention to acute care, short term therapy (Becker, 1961; Starr, 1982; Longino and Murphy, 1995). Whereas it is widely accepted that many persons with disabilities and chronic illnesses require nursing home, home-based care, and

other long-term care services, the fact that these individuals also are heavy users of physician and hospital care is less well appreciated (Weiner and Skaggs, 1995). Long-term care is considered a second-rate endeavor within the medical profession. For decades, physicians have avoided involvement in long-term care settings (Vladeck, 1980). Relations between nursing staff in long-term care facilities and medical providers in acute care centers are characterized by mistrust and poor communication (Kaiser-Jones, Barbaccia, Wiener, 1989). For many individuals with chronic illnesses and disabilities, the result has been uncoordinated, fragmented, and inefficient care.

Policy Issues

Since the 1960s, the leading policy issues in nursing homes have been: quality, access, and costs (Vladeck, 1980; Institute of Medicine, 1986; Kane and Kane, 1987). In effect, there has been substantial progress in improving quality and access while controlling costs (e.g., the 1967 amendment to the Social Security Act; OBRA, 1987). Today, at least a minimum standard of quality is widely approached (Vladeck, 1996). Yet, even as front-page scandals have become less frequent, nursing homes are subject to intense research and policy attention. Quality and access remain unsatisfactory (Harrington, 1996), and nursing homes continue to be a leading source of rising health care costs, not simply because of price inflation but also by virtue of the relative aging of the population (Thorpe, 1992), and payers have never ceased looking for ways to contain their expenditures.

Containing long-term care costs has long been a leading policy goal. Often, programs and interventions are evaluated almost exclusively in terms of their effects on costs. Long-term care costs have been especially weighty for state governments since the Medicaid program covers approximately half of all nursing home expenditures. These costs approached $70 billion in 1993 (Levit, Sensenig, Cowan, et al., 1994), and they are expected to reach $131 billion by the year 2000 (Sonnefeld, Waldo, Lemieux, and McKusick, 1991). Private insurance's contribution has been negligible, covering less than 4 percent, and individual users and their families have had to pay out-of-pocket for virtually all remaining costs.

Policy Efforts Hampered by System Fragmentation

Health care policy efforts have been stymied by the fragmented nature of the larger health system. Discontinuities between the acute and chronic care sectors have perpetuated structural obstacles to a more efficient, higher quality system. The need to integrate services is increasingly recognized (Vladeck, Miller, and Clauser, 1993; Phillips-Harris and Fanale, 1995). The most prominent approach to such integration has been capitated, managed care. Specific programs include Social HMOs, On Lok and its Program for the All-inclusive Care of the Elderly (PACE) replications, as well as the Arizona Long-Term Care System. Unfortunately, as noted by Weiner and Skaggs (1995), these programs have been incompletely evaluated, and it is difficult to distinguish the separate effects of capitation and service integration. However, to date research findings are sufficiently positive to recommend further implementation of service integration (Kane and Kane, 1987), as well as increased research funding (Weiner and Skaggs, 1995).

Patient transfers between home, nursing home, and acute care center have received increasing attention in the research literature. The majority of studies have focused on transfers into nursing homes from hospitals (Kane and Matthias, 1984; Shaughnessy and Kramer, 1990) or from all other non-nursing home settings (Branch and Jette, 1982). The transfer from nursing

homes to hospitals has only recently been comprehensively evaluated (Kane and Kane, 1987; see Castle and Mor, 1996). Studies have tended to investigate individual predictors of institutionalization (see Jette, Branch, Sleeper, Feldman, and Sullivan, 1992). Few studies, however, examine how social-structural factors in the home, nursing home, or hospital contribute to risk of transfer (Kayser-Jones et al., 1989). Consideration of telemedicine's potential for improving quality of care and the appropriateness of transfers necessitates exploration of the processes of care and the circumstances of inappropriate care and transfer decisions.

Near-Acute Care

The focus here is on a limited range of the continuum of long-term care services -- near-acute care provided in nursing facilities and in the homes of individuals at high risk of institutionalization. Kane and Kane (1987) rightly define long-term care in broad terms, as the "set of health, personal care, and social services delivered over a sustained period of time to persons who have lost or never acquired some degree of functional capacity". Hence, long-term care is not limited to nursing home and home-based services. It refers to a broad continuum of services (also see Evashwick, 1993).. We do not here consider care and social services provided by adult day care centers, meals on wheels programs, home-maker or various other support services. The emphasis is on institutional and home-based care for the severely disabled, on telemedicine's potential for addressing near-acute and acute care needs.

The rationale for pursuing near-acute care is two-fold. First, these patients generate high costs. Nursing home costs are high in general -- average costs range between $2,000 and $4,000 per month, almost half (48 percent) of which is privately paid (Burwell, Crown, O'Shaughnessy and Price, 1996). Costs are substantially higher for those needing more acute care. Hospitalizations are more expensive than nursing home services on a per diem basis, though stays are typically far shorter. The drive for cost containment has brought much attention to the need to prevent inappropriate institutionalization and costly transfers to more specialized care facilities. Telemedicine's most immediate rationale is to facilitate the flow of information and care -- to improve care for patients in the least costly and most home-like environment, and to achieve an overall cost savings.

Second, as noted by Shaughnessy (1991), it makes sense to begin the process of integrating the acute and long-term care sectors at the point of their contact. The care and management of near-acute patients engages both acute and chronic care providers. Intuitively, telemedicine seems to be especially suited for improving the continuity of care for these patients, and by so doing to integrate a fragmented delivery system. Of course, a fully integrated system would establish links not only between hospitals, physician offices, nursing facilities and the private homes for high risk patients but also between these places and adult day care centers, home health workers, and various other services. We have a long way to go before reaching such integration. A reasonable start is the connection between acute care providers, nursing homes and high-risk individuals in their homes.

Finally, nursing facilities offer a mix of medical, social, and residential services, and as institutional providers of near-acute care, they offer a particularly appropriate point of intervention (Shaughnessy, 1991).

Nursing Homes

In considering telemedicine's potential role in improving patient care and resident management in nursing homes, it is necessary to understand: (1) the development of the nursing home industry and how the underlying structures have affected programs and providers; (2) the concerns and perspectives of the various actors in the nursing home setting, as well as its social, physical, and organizational context; and (3) the current trends which are reshaping the nursing home industry. This information provides the background and perspective necessary for assessing telemedicine's potential in this context.

Development of the Nursing Home Industry. The nursing home industry was largely a byproduct of policies directed toward other aspects of the health care system. In the late 19th and early 20th century, aged and chronic patients were consigned to stigmatizing public care in almshouses. The newer hospitals oriented themselves toward acute care, and they were unwilling to admit patients with chronic conditions (Rosenberg, 1995). Passage of the Social Security Act of 1935 led to the rise of for-profit nursing homes. Struggling families opened their doors to boarders, and many "Mom and Pop" nursing homes were established. The Hill-Burton legislation (1946, 1951, 1954), which supported the construction of hospitals, provided substantial funding for building nursing homes. These were larger facilities, built on the medical model (Vladeck, 1980). The Federal Housing Act (1959) and the Kerr-Mills Act (1960) together guaranteed nursing home mortgages and some payments for patients. As a result, nursing homes transformed from small Mom and Pop homes into more business-oriented institutions.

The Great Society legislation of the 1960s further affected the recently formed nursing home "industry" in unexpected ways. Medicare, a program expressly designed for meeting the medical care needs of older Americans, has had relatively little influence on nursing homes. Medicaid, however, which was targeted toward children's needs, took on the intermediate care needs of the elderly, thereby guaranteeing that nursing homes would be paid. Consequently, today most for-profit nursing homes belong to chains. Further, since Medicaid paid almost half of all nursing home expenditures, government became more involved in regulation.

A final unexpected outcome of governmental action: President Reagan in 1985 sought to limit nursing home regulation, and he commissioned a study by the Institute of Medicine. Its report, however, endorsed a strong federal regulatory presence in nursing homes (Institute of Medicine, 1986; Kane and Kane, 1987) and a revision of standards to focus more on outcomes, quality of life and civil rights.

Historically, the development of the American health care system has resulted in the separation of the acute from the chronic, and nursing home care has suffered in its isolation from acute care providers. In spite of years of research and legislative attention, a simple somber truth remains, "nursing homes are not nice places to live... [or] ... to work" (Kane, 1990).

Participants: Residents / Patients. About 5 percent of people over 65 live in nursing homes at any one time. Estimates of lifetime risk of entering a nursing home range from 30 to 46 percent (Liang and Tu, 1986.) Leading predictors of institutionalization include: previous institutionalization, age, basic ADL disability, restricted outside mobility, mental status, and lack of social support (Kane and Kane, 1987; Jette, et al., 1992). Often, admission is involuntary and traumatic (Kane, 1990).

The population of nursing homes is quite heterogeneous. About half of new admissions will stay less than 6 months. Long-stay residents may stay for 10 years or more. Median length of stay in 1985 was 82 days for live discharges, and 163 days for those who died (Kane, 1990).

Residents are more likely to be female, functionally impaired and poor than are their counterparts.

Family plays a major role as a source of information, support, and power for the nursing home resident (Gubrium, 1975; Kane, 1990). The perception that modern families "dump" their needy relatives into nursing homes is incorrect. In fact, families are likely to wait too long before admitting a relative.

The nursing home is, most centrally, a place of residence. While the nursing home staff and outside specialists may work in or visit the nursing home, their time in the nursing home is clearly demarcated as a visit with a clear end point. The resident's experience of time and place is quite different; there is no clear end point, one simply lives there.

In the social world of the nursing homes, high status is associated with independence. The terms "resident" and "patient" have a specific social meanings in nursing home context (Gubrium, 1975). A "patient" is someone who requires special care or is otherwise relatively limited, typically because of cognitive or functional disability. The term "resident" reinforces an identity as an autonomous person who happens to be living in a nursing home. This distinction reflects the various worlds of the "social" and "medical" in the nursing home.

Staff. Gubrium (1975) distinguished between "top staff" from "floor staff". Top staff includes the administrator and director of nursing, and also the medical director. Kane (1990) explained, however, that house physicians are unusual, and the medical director may not have any significant presence. Gubrium argued that top staff are primarily concerned with appearances to outsiders, particularly regulators. Top staff are motivated by a sense of mission, and will follow particular cases. However, cases are often only superficially considered; patients are quickly labeled and dealt with, ignoring contextual factors.

Floor staff, who include a few RNs, LPNs, and many nursing assistants, provide the mainstay of care. This paraprofessional work force is usually overworked, poorly paid, and minimally trained (Kane, 1990). Not surprisingly, there is rapid turnover among nursing home caregivers. The bulk of direct care (80 to 90 percent) is provided by nurse's aides, and on average each resident receives just 12 minutes of skilled nursing time per day (Institute of Medicine, 1986). The overriding concern of floor staff is to manage a typically overloaded work schedule -- in effect to maintain the appearance of quality, so as to avoid difficulty with supervisors. As a result, nursing staff are generally too busy to provide much psycho-social care to residents; indeed, sometimes housekeeping staff are the only persons providing psycho-social contact and support (Henderson, 1981).

Floor staff tend to "objectify" their clients. Gubrium (1975) refers to the tasks performed by floor staff as "bed and body work". Communication between nursing home staff and providers at acute care facilities is irregular, inadequate for patient evaluation, and characterized by mistrust. Hence, floor staff and administrators are motivated to transfer their high load and high cost patients to other facilities. Hospitals are increasingly guarding against patient dumping, yet nursing home staff would still seek to transfer high-care patients. Similarly, when their physician counterparts benefit financially from their patient's hospitalization (Zimmer, et al., 1988), the potential for inappropriate transfers looms large.

Ongoing Trends. Three general and related trends are affecting nursing home structures and care. **First**, via managed care, the growth of multi-institution health care networks (Fennell and Alexander, 1993), and various programs fostering financial integration, long-term care

organizations are becoming more integrated with acute care service providers. **Second,** the level of need in nursing homes is rising (Shaughnessy and Kramer, 1990; Holtzman and Lurie, 1996.). Since Medicare's 1983 shift to a prospective payment system (PPS) hospitals have sought to discharge patients "quicker and sicker". Shaughnessy and Kramer (1990) found that between 1982 and 1986 the prevalence of medical problems and cases requiring skilled nursing increased significantly among Medicare recipients in high-Medicare nursing homes, while the prevalence of functional problems was relatively unchanged. Shaughnessy and Kramer also found these patterns in home care settings, however in "traditional" high-Medicaid nursing homes there was little change in those requiring medical and skilled nursing care. **Third**, there is increasing competitiveness and specialization among nursing homes, or, more generally, "nursing facilities". Nursing homes are increasingly opening specialized care units (SCUs) (Zinn and Mor, 1994; Mor, Banaszak-Holl, and Zinn, 1996), which generate higher revenues than do intermediate care beds. Currently, 10 percent of nursing facilities have some kind of SCU.

Enter Telemedicine

Definitions of telemedicine share the basic concept implied in the term itself, medicine at a distance. That is, telemedicine involves the activity of "two or more (geographically separated) interactants engaged in health care, be they provider and client, provider and provider, or either provider or client and computer" (Bashshur, 1995). Not simply a tool, telemedicine is best conceptualized as a system of health care delivery and education.

Telemedicine research and business activity got off to an inauspicious start in the early 1960s, remained active for about 15 years, then lay relatively dormant for two decades. In the past 5 years, telemedicine activity has been renewed, as witnessed by the recent profusion of publications (Johnson, Pebsworth Debold, Chuang, Tolbert, Cameron, Miller, 1995). In part, this is due to substantial advances in information technology matched with declining prices. Perhaps, a more fundamental reason for the resurgence of telemedicine is the persistence of fundamental problems in health care delivery that may be effectively addressed by telemedicine (Bashshur, 1995). Access problems persist in remote locations and for disadvantaged segments in the population. Indeed, these populations include nursing home residents and home-bound chronically ill or disabled individuals. Typically, they have limited access to acute care centers and physicians by institutional, physical, and logistical barriers.

Cost containment strategies are being actively pursued at all points in the continuum of health services. Integrated forms of health care delivery, including telemedicine systems, are being pursued as a means of rationalizing the distribution of medical expertise over a large, geographically dispersed service population

Finally, quality concerns have also influenced the resurgence of telemedicine projects. By extending access to medical expertise, it is hoped that the quality of care received may be enhanced in a cost-effective manner. The persistence of these problems is in large part due to the way that health care services are organized and financed, and the artificial imposition of an acute care - chronic care distinction in the health care continuum.

Managed care is fast becoming the norm in clinical practice. Physicians, happily or not, are increasingly being integrated into health care organizations; independent hospitals are being replaced with networks; and fragmented delivery structures are being reorganized to provide "seamless" continuity. These changes, long in coming, have significant implications for nursing

home care and for the intersection of acute and chronic care. For all these reasons, the potential of telemedicine has taken on renewed interest among health care policymakers.

Telemedicine systems may resolve or at least diminish long-standing obstacles to improved nursing home care, such as inadequate staff training and capabilities, mistrust and poor communication between nursing home staff and outside physicians, and the physical distance separating nursing home patients from high technology and medical expertise. They may also provide help to avoid or delay institutionalization for at-risk individuals living in their homes.

While there is reasonable consensus about what is meant by financial integration -- the pooling of funds -- there is far less consensus about what integration means for the delivery of services. One view is to improve transitions and referrals between acute and long-term care services. Another is to change the ways in which provider give services, to emphasize multidisciplinary teams. Telemedicine has potential utility in both regards. A telemedicine connection may improve the quality of urgent, long-distance, decision-making. It may also facilitate team approaches to care which would prevent or delay the need for transfer to a higher level of care.

Telemedicine systems may help in achieving integration of acute and long-term care services. Organizational reforms that integrate acute and long-term care may prevent unnecessary hospitalizations from nursing homes (Barker, Zimmer, Hall, et al., 1994). However, important questions arise. How might telemedicine connections between homes, nursing homes, and hospitals improve patient care and clinical decision-making? To what extent might telemedicine thus improve the appropriateness of patient transfers, and thereby avoiding unnecessary trauma and expense? More generally, what is telemedicine's potential to affect patient-provider and provider-provider communication? Ultimately, what are the effects on quality of life, access to information and services, quality of care, and system costs?

In brief, as the larger health care system has moved toward managed care and multi-institution health care networks, the potential utility of telemedicine linkages among system components has regained prominence. A telemedicine system may improve coordination of care, improve diagnostic and treatment decision making, and ultimately help bring about better care, improved access and overall efficiency in the health care system (Bashshur, 1995). Indeed, telemedicine may lead to greater integration of and communication among long-term and acute care providers. In both nursing home and home-based settings, telemedicine may improve continuity and coordination across the acute and chronic care sectors. Yet, there are important constraints imposed by the social, organizational, and professional structures that form the fabric of the current medical system.

Goal: To Avoid Inappropriate Institutionalization / Transfers

Of primary interest here is the degree to which telemedicine may improve the health and well-being of those nursing home residents or home-bound individuals who are at high risk for transfer to a facility offering a higher level of care. Research by Kayser-Jones and colleagues (1989) indicated that almost half of all nursing home transfers to hospitals (48.2 percent) were unwarranted. Freiman and Murtaugh (1995) estimated that in 1987, 816,000 persons were transferred from nursing homes to hospitals. Reasons offered for the unnecessary transfers included insufficient numbers of adequately trained nursing staff, poor nurse-physician communication, family pressure for transfer because of mistrust of nursing facility staff, and physician pressure for transfer because of reluctance to travel to the nursing home.

In 1991, over half of all nursing homes had fewer than 100 beds, and only 7.5 percent had 200 or more beds (Sirrocco, 1994). Large, government-owned long-term care facilities with many on-site physicians are the rare exceptions.

Examining data from interviews with staff and reviews of patient records in 10 long-term care facilities in New York State, Teresi and colleagues (1991) found that high transfer rate facilities were more likely to transfer chronically ill, physically frail patients; those with infection (which the authors argue is potentially treatable condition in the facility); and in cases where there is a lack of resources, such as a lab or x-ray equipment. The importance of intravenous therapy was equivocal, however, and communication and trust issues were not examined.

The literature on predictors of hospitalization of nursing home residents is still in its early stages of development. Comprehensive analysis is warranted to better understand the range of factors influencing the risk of transfer (Castle and Mor, 1996). It seems clear, however, that physicians play a critical role in hospital transfers (Kayser-Jones, et al., 1989; Teresi, et al., 1991); they make 90 percent of transfer decisions. Zimmer, et al. (1988) demonstrated that physician reimbursement methods can be critical in transfer decisions. Physicians are generally reimbursed while visiting a hospitalized patient, and their visits to the nursing home are often not reimbursed. Faced with uncertainties about the quality of care in a facility or about whether a patient's family might make trouble for them, physicians are more likely to hospitalize a nursing home patient. Telemedicine would provide a valuable means of communication and reassurance for the patient, the family, and care providers. In many domains, telemedicine would reduce uncertainty.

The studies here reviewed offer a rare qualitative analysis of the clinical and social-structural factors contributing to the hospitalization of nursing home residents. Though further studies are needed, the extant analyses provide valuable insights into the problems of nursing home care and the poor connections between nursing home and acute-care facilities. Their assumptions and results are consistent with the broader literature on nursing homes, on professions, multidisciplinary teams, and the relationship of nursing homes with acute care hospitals. In sum, this literature provides insight regarding how telemedicine may be able to improve nursing home care and reduce patient transfers.

Inter-organizational Relations

Several organizational theories assist in explaining the relationship between hospital-based physicians and nursing home staff. Two theories appear particularly applicable to this issue -- resource dependence theory and institutional theory.

Resource Dependence Theory. Resource dependence theory posits that organizations cooperate in order to acquire resources for themselves. Resources include people, money, prestige or any other supply element needed for continued production (Milner, 1980). Thus, hospitals need nursing homes to which they can discharge patients needing long-term care and from which they can acquire patients needing acute services. Nursing homes need hospitals for an incoming supply of patients and as a facility to which they can transport patients in need of acute care. Patient transfer is not the only way for these two entities to share resources. They can also share information. At present, the flow of information usually runs from the hospital to the nursing home. Additionally, many hospitals and nursing homes do not operate within an integrated care delivery system. As such, hospitals and nursing homes may not have the necessary external incentives to provide more coordinated care without some type of mandatory

regulation. Furthermore, the separate financing systems dedicated to acute care (Medicare) and long term care (Medicaid) do not promote a sense of shared responsibility for the cost of patient care among hospitals and nursing homes (Wiener and Skaggs, 1995). Integrated systems provide an inherent incentive for hospitals and nursing homes to work together to limit the number of inappropriate admissions to the hospital. Without such restraint, the overall system will incur higher costs. Similarly, if Medicaid and Medicare were to coordinate reimbursement for acute and long-term care, hospitals and nursing homes would have external pressures to work together more closely and potentially lower the cost of care.

Institutional theory describes external pressures affecting organizational behavior, and proposes three types of forces which impact organizations: normative, mimetic and coercive. The dominance of the medical profession supports the provision of acute care in a hospital setting as opposed to a nursing home. This is an example of **normative** pressure. Chronic care provided in a nursing home is viewed as palliative whereas acute care provided in a hospital is viewed as curative. The medical profession seeks to cure patients, not to simply care for them. However, if nursing homes started to provide acute care services on site, this behavior might be **mimicked** by other nursing homes. This would be an example of mimetic pressures. Finally, nursing homes are the second most regulated industry next to nuclear power plants in the U.S. For example, nursing homes must contact a physician if there is any change in the health status of a patient. Here, we can see that a **coercive** pressure is exerted that requires contact between nursing homes and physicians.

Intra-organizational Relations

Together, nursing homes and hospitals constitute the context in which the individual physicians, nurses and other staff operate. Two related theories explain the relations that occur within organizations. **Structural theory** deals with the rules and regulations of an organization. Formal communication channels and decision-making systems relate to the status and power that individual staff members, work units and larger sub-organizational units have. **Cultural theory** argues that there are soft-wired elements which affect staff member behavior. Although the organizational structure may dictate certain lines of communication, in actuality a separate system may develop which bypasses individuals or departments with "paper" power and elevates other seemingly powerless individuals to crucial roles .

Furthermore, individuals enter an organizational setting not as blank slates, but as individuals with a variety of ascribed and acquired attributes (Sampson and Marthas, 1990). Ascribed attributes include labels such as male/female and acquired attributes include nurse/physician. The intersection of the organization's structure and staff member's attributes contribute to the development of an organizational culture that transcends the hardwired structure of the organization. For example, nurses and physicians receive different types of training which dictate two distinctly different sets of professional norms. These nurses and physicians bring their normative perspectives to the organizational setting in which they work.

Cross-Organizational and Multidisciplinary Work

There are at least two distinct types of barriers that must be overcome for the nursing home staff and the acute hospital-based physician to cooperate effectively: organizational and professional barriers. Physicians and nurses not only need to communicate across organizational boundaries but also attempt to work effectively with each other as members of distinct professions. A whole range of issues arise to explain the potential for conflict and order when

individuals are engaged in cross-organizational and multidisciplinary work. Three perspectives help to organize those issues: conflict, functionalist and symbolic interactionist (Nagi, 1975).

The conflict perspective focuses on issues of status, authority and influence. Rather than explain how physicians and nurses function well together, it describes structural constraints within and between organizations which contribute to conflict between the nursing home staff and physicians. For example, the dominant position of physicians in the medical hierarchy and the normative status of providing acute versus chronic care results in the transfer of patients to the hospital setting. Physicians neither trust the less skilled nursing home staff nor desire to provide care in a chronic institutional setting. In contrast, the functionalist perspective points to the roles that each actor plays. Physicians act in a curative capacity while nurses act in a caring capacity. The distinct professional domains and jurisdictions of each profession help to order the tasks of the physician and the nurse. The functionalist sees order rather than conflict in the relations between the professions. In our opinion, the truth lies somewhere between the conflict and functionalist perspective.

A third perspective is wholly separate from the conflict and order typology. It is the symbolic interactionist perspective. Here, the process of interaction, systems of decision-making and communication are investigated. The different perceptions, concepts, methods and treatment modalities of physicians and nurses help to explain their ability to both clash and cooperate. If the hospital-based physicians and nursing home staff could work together as a team, there may be a greater potential for decreasing inappropriate admissions to hospitals. Lowe and Alexander demonstrated a 50 percent reduction in hospital admissions for children in Maternal and Infant Care programs that used a team-based approach to delivering services (Lowe and Alexander, 1974).

Provider-Patient Relations

Finally, the relationship between the provider and the patient is equally important to the success of the enterprise. A negative medical encounter can result in lower client satisfaction, poorer communication, worse quality of care and lower health outcomes. The quality of medical encounters relates to contextual factors as well as the content of care..

Contextual effects are determined by the structural environment of the medical encounter. The social stratification of society at large is mirrored in the patient-provider encounter. The age, gender, ethnicity, class, and health status of both the patient and the provider affect the quality of the encounter (Haug, 1996). Morgan found that young individuals in nursing homes were deemed "inappropriate" by nursing home staff, and that they were seen as more dysfunctional and confused as compared to older residents (Morgan, 1985). Additionally, the context and location of the encounter can affect not only the health care professional's behavior toward the patient, but the health outcome of the encounter. It matters on whose turf the encounter takes place. Is the patient required to go to the hospital in order to see the hospital-based physician or will the physician come to the patient's residence? The attributes of the location, such as size, also matter. Morgan found that the number of patients in nursing homes affected professional diagnostic judgments.

In addition to these structural elements, certain aspects of the medical process are critically related to outcomes, including client satisfaction and health status. For example, whether a patient in a nursing home is viewed as a "resident" or a "patient" can alter the nature of the encounter. As a resident, the full psycho-social world of the client is validated. As a patient,

the clinical aspects of the client are highlighted. The patient is objectified in order to make "bed and body work" less emotionally encumbered. Power is symbolized in the provider-patient relationship in many different ways. For example, physicians reserve the title "Doctor" yet address patients by their first name (Haug, 1996). How the physician treats the nurse in front of the patient also establish power hierarchies. On top of this, the older patient is at a greater risk of being involved in fragmented clinical decisions when different specialists are assigned to various health conditions (Beisecker, 1996). Often, the older patient with chronic conditions has a third person (usually a family member) to help with choice of treatment (Prohaska and Glasser, 1996). Hence, disagreements may arise between providers, patients, family members and others.

Finally, Mishler (1994) suggested that the "voice of the life world" competes with the "voice of medicine." The voice of medicine uses very clear closed-ended questions designed to probe the client for answers to clinical questions related to the specific condition for which the provider is to treat the patient. The patient, however, employs the "voice of the life world," and may provide information about lifestyle, fears, emotions, relationships or other elements the provider may deem inappropriate. Yet, this additional information often provides information that could truly help the provider assist the patient.

Factors Affecting Inappropriate Hospitalizations

Since telemedicine may have the potential of reducing inappropriate hospitalization and emergency room service, it is important to consider the factors contributing to the inappropriate hospitalization. According to Kayser-Jones and colleagues (1989), three types of factors contribute to inappropriate hospital admissions among nursing home residents: clinical, structural and interpersonal.

Clinical factors include infection, bed sores, improper oral tubation, improper or no intravenous administration capability, poor nutrition and dehydration. Many of these conditions could have been prevented by providing adequate treatment while the patient remained in the nursing home, thus avoiding a transfer to the hospital.

Structural factors include the distance it takes for physicians to travel to the nursing home. It is easier for the physician when the patient travels to the hospital. Additionally, if reimbursement is low, it may not be cost effective from the physicians point of view to travel to the nursing home. The nursing home itself often lacks adequately trained staff or an adequate number of staff to provide the necessary care on site. This makes the workload increasingly difficult for a poorly qualified staff. The professional dynamics between the nursing home-based nurses and the hospital-based physicians has the potential to block any effective communication, thus, resulting in a transfer to the hospital. Finally, the organizational relationship itself between the nursing home and the hospital is critical. It is highly possible that if the organizations were members of the same network, there would be an incentive to reduce inappropriate admissions.

Interpersonal factors include poor communication between hospital-based physicians and nursing home staff, physician mistrust of nursing home staff competence, and nursing home staff and family pressures to transfer the patient to the hospital.

It is reasonable to assume that poor training and capabilities in nursing homes would be improved as part of a telemedicine intervention -- via enhanced opportunities for training and evaluation. Further, it is clear that physicians have an important role to play in the nursing home (Vladeck, 1980; Institute of Medicine, 1986; Kane and Kane, 1987; Kayser-Jones, et al., 1989).

A greater physician presence, or even tele-presence, in the nursing home should improve trust and communication across settings; it should also improve the level of care provided by nursing staff. As well, physician tele-presence should reduce the need for hospitalization and emergency room visits. Telemedicine consults provide a means of assessing the need for medical help and can avoid unnecessary transfers, as well as encourage appropriate ones (Greenberger and Puffer, 1989).

Finally, telemedicine has the potential to create better health care. While there have been few recent studies of telemedicine in nursing homes, one of the best was an early study by Mark and colleagues (1976). They provided initial evidence of how a telemedicine system using specially trained nurses can improve patient care and reduce hospitalizations.

Physician Absence and Hospitalization

Physician absence has long been considered a major obstacle to improved quality of medical care in nursing homes. Indeed, one of the few predictors of improvements in functional status of nursing home residents is the quality of the medical care they receive while there. To date, most of the efforts to increase the presence of physicians in nursing homes have been regulatory, such as mandating a minimum frequency for patient evaluations, the establishment of the medical director role for skilled nursing facilities (SNFs) in 1974 (Pattee, 1995), and the recent extension of this requirement to all nursing homes (OBRA, 1987).

Efforts to increase the nursing staff skills and capabilities have been hampered by inadequate reimbursement for nursing home workers and the resulting high turn-over among caregivers.

The lack of physicians in nursing homes has contributed to the fragmentation of patient care, and fragmented contact among providers, increasing the likelihood of transfer during an acute episode (Kayser-Jones, et al., 1989). Such absence may also increase family and nursing staff pressures to hospitalize individuals to secure reassurance from the provider.

Hospitalized patient are likely to experience "transfer trauma" (Kane and Kane, 1987), which may increase their risk of mortality. While the impact of transfer will depend on whether the resident wanted to move, hospitalizations may threaten a resident's identity, separating her from familiar surroundings and shifting from a fairly social to a strictly medical environment. Further, when hospitalized, nursing home residents are especially vulnerable to a cascade of dependency -- they are likely to experience deterioration of functional status and development of problems that are unrelated to the cause of admission (e.g., pressure sores) (Murtaugh and Freiman, 1995). Transfers are disruptive and costly, and hospitalization usually is the most expensive option.

Another outcome of unnecessary hospitalization is that access to these acute care beds may be limited, particularly in tight hospital markets such as upstate New York (Lagoe, 1991).

The Role of Telemedicine

Telemedicine has the potential to improve the quality of care being provided to patients in nursing home settings and reduce inappropriate transfers from nursing homes to hospitals. Its potential contributions fall in four broad areas: improving training, eliminating the distance barrier, reducing nursing staff burden and improving communication.

Potential Positives It is anticipated that telemedicine would improve certain outcomes, including training, trust-building and communication. Through the process of on-going contact between the hospital-based physician and nursing home staff, it is expected that the nursing

home staff would by privy to more clinical discussions than if the patient had been transferred to a hospital. The nursing home staff will be able to learn from each encounter and in this way telemedicine will have an indirect training benefit. Additionally, the communication between physicians, nursing home staff, patients and administrators at the nursing home is expected to improve. Telemedicine will facilitate the communication process, making it easier for nursing home staff and physicians to communicate with each other. As the communication improves, the relationship between staff at the hospital and nursing home should improve. Greater trust should evolve as physicians acknowledge the skill level of nursing home staff and recognize conditions not warranting a transfer to a hospital. In this way, telemedicine may have the potential to personalize the physician-nurse relationship. "Personalizing involves developing and maintaining an intimate and informal relationship which allows the members to know each other in a more predictable way and consequently to enhance their working together" (Buhler, 1982).

The ultimate outcomes pertain to the quality of care provided via enhanced training, improved communication, and contained costs due to a decrease in unnecessary hospitalizations. Finally, patient satisfaction will likely improve as patients may build stronger relationships with nursing home staff and physicians, and avoid unnecessary and disruptive transfers. The transfer of some elderly patients are psychologically and socially disruptive (Greene and Adelman, 1996). Also, telemedicine may improve the patient-physician relationship if there is an increased interest shown by the physician in the patient (Putnam, 1996).

Potential Negatives The way telemedicine is implemented will greatly influence whether it will be successful or not. If telemedicine is implemented primarily as a monitoring tool, the nursing staff may not view it as a resource for them. Additionally, if it is difficult to learn and operate the system or if equipment fails to operate frequently, the system will be viewed as a burden not a boon.

Jurisdictional tensions may arise between the nursing home and the hospital or between physicians and nurses in caring for patients. Telemedicine will allow increased scrutiny of nursing home activity and of patient-provider relations in general. Clinical staff (doctors and nurses) may feel uncomfortable discussing certain problems with the patients listening and watching. Since it is not face to face, the encounter may be impersonal as well as intrusive for the patient and the nursing home staff.

Physicians may be discouraged by poor reimbursement or uninteresting clinical cases to utilize telemedicine as intended. Nurses may feel that they are under increased scrutiny while assuming an increased work load. Patients may feel depersonalized in a technologically-based medical encounter. Finally, administrators may not want to open the door to external monitoring and investigation. While still subject to conjecture, these issues are critically important to the potential success of telemedicine for reducing inappropriate hospital admissions.

The Nursing Home Setting

Telemedicine's potential to reduce inappropriate admissions and improve quality of care for chronically ill or disabled individuals may be greatest in the context of an integrated system of care. This is particularly relevant in light of the fragmented nature of the U.S. health care system. For example, the disjointed funding systems of Medicare and Medicaid reduce the financial incentives to control inappropriate admissions when nursing homes and hospitals are

not members of the same system. A coordinated reimbursement policy is needed in order to decrease costs and increase the quality of long term care (Freiman and Murtaugh, 1995).

Home-Based Care

Home health care refers to a combination of health and social services provided to individuals and families in their homes on a short-term or long-term basis (Harrington, 1988). The home health care industry has grown rapidly in the past three decades, and it is expected to continue to grow well into the next century. Home health care has expanded as a result of public funding, increased demand by virtue of population aging and public preference; and improved technical capacities for providing in-home care. Expenditures for home health care has increased from $0.6 billion in 1960 to $38.5 billion in 1990. In 1987, approximately 5.9 million Americans used an average of 44 home care visits. Clients had a mean age of 70, and they utilized care an average of 94 days (Hughes, 1996). Home-care clients tend to have functional impairments comparable to those of nursing home entrants (Kemper, Applebaum, and Harrigan, 1987).

Telemedicine in the Home

Telemedicine for home-based clients typically employ two-way telecommunications to link outside providers in a nursing home or acute care hospital with individuals or families in their own homes or home-like settings. Under this arrangement, the client and the provider are able to reach each other on a regularly scheduled basis or on demand without requiring one to travel to the other. Hence, home-based telemedicine is expected to improve continuity of care; to alleviate the burden of caring for a family member in the home; and to reduce the need for emergency room visits and hospitalization. If all goes well, the net effect should be a reduction in the cost of care and an improved quality of care and of life.

As in nursing homes, telemedicine would enable immediate access to health professionals for homebound individuals. Depending on how it is structured, access to a provider may be available on a continuous 24-hour, 7-day week basis, or it may be limited to regularly scheduled time periods, except for emergencies. To make this work, the technology must be simple and user-friendly for both provider and client. To make it feasible, the price must be affordable when paid out of pocket or else covered by third party payers.

Potential Effect on Quality

The intended clients of home-based telemedicine are chronically ill patients who are often "revolving door" patients who frequent the emergency room and the hospital. Telemedicine offers these individuals a convenient and readily available resource to receive much of their needed care in the familiar surroundings of their home environment. Further, it provides home-bound individuals with a reliable window to the outside professional world, thereby reducing feelings of isolation and abandonment. For instance, patients recently discharged from intensive medical care settings may feel less isolated from their medical supports (Arras and Neveloff Dubler, 1994). Perhaps, more importantly, their health would be monitored to detect changes in symptoms or clinical indications, and their compliance with prescribed regimen would be observed and encouraged.

For the provider, telemedicine also offers a reciprocal window to the patient/client home environment. Though partial and possibly selective, this window enables providers to gain a better understanding of the patient's home life. In turn, such information may help in

recommending appropriate treatment options likely to be followed. In some ways, the virtual visit over telemedicine would be tantamount to an actual home visit, giving the provider additional input into the care process.

Questions have been raised regarding the consistency of quality in home health care (Harrington, 1988.) These questions have been related to case workers being tardy or spending inadequate time with their patients. Even when workers are conscientious and prompt, monitoring the delivery of home health care has been difficult for obvious logistical reasons. The patient/client has to be either alone or under the care of a family member most of the time. Telemedicine systems promise to provide a continuous clinical "virtual access" as a means of quality assurance.

Potential Effect on Cost

When home-based telemedicine can serve as an effective substitute for in-patient care or emergency room visits, the potential cost savings are substantial without jeopardizing the patient's health or well-being. Telemedicine systems may enable faster discharge of hospitalized or nursing home patients. The home setting is a far less expensive locus of care. It may be possible to slow the movement of "revolving door" patients from home to hospital or nursing home.

Lessons from Home Health Care

Because of its newness, there have not been any empirical studies of the effectiveness of home-based telemedicine systems. Nonetheless, these systems have received increasing attention because of their potential for reducing system fragmentation, improving continuity and quality of care, containing costs, and extending access to needed services.

For many of these same reasons, proponents of community- and home-based health care have long called for extended home care benefits and research to evaluate and refine these community- and home-based programs for long-term care. Since the early 1960s, researchers have sought to investigate the benefits and costs of home health care (Weissert, Cready, and Pawelak, 1988), and many demonstration projects have been conducted. Important insight may be drawn from this broader literature, on community and home-based care, even though this literature does not deal with telemedicine directly.

This literature provides a sobering assessment of plain home health care (i.e., unrelated to telemedicine interventions). While home care programs are attractive conceptually and intuitively, they have tended to cost more money that they saved (Weissert, 1985; Weissert, Cready, and Pawelak, 1988; Weissert, 1991). The evidence suggests that whereas home-based care has sometimes prevented institutionalization, only short-term nursing home stays have been avoided. Often, home-based care has served as a complement rather than a substitute for nursing home care. Further, because of their convenience and ease, home services are in high demand. When such services are offered, individuals claiming need seem to come out of the woodwork (this is referred to as the "woodwork effect"), whether or not they would have been institutionalized.

Home health services must be targeted to individuals who are most at risk of institutionalization. In general, programs have not been well targeted to those for whom level and mix of inputs can be weighed against expected outcome benefits (Weissert, 1991). Whereas those receiving such care have benefited, no commensurate cost savings have been accrued.

Targeting high-risk clients has posed a significant hurdle in home-based long-term care programs. Screening is necessary, difficult, and expensive. Despite the numerous studies to

identify characteristics of those most at risk for institutionalization, it remains quite difficult to predict which of these individuals will ultimately be institutionalized. Typically, many geographic areas have had too few individuals at such high risk for a home-based program to enable a reasonable economy of scale. When enrollment is low, per capita costs are high. Those programs which have been able to show some success have been in urban settings where a high number of such high-risk individuals are concentrated (e.g., On Lok and its PACE replications.) In most of the country, where there are not sufficiently high concentrations of at risk individuals to warrant in-person home-based care programs, telemedicine systems may offer access, better care, and sufficient economies of scale.

Finally, home care programs have not yet found sufficient political support to provide a broad and un-fragmented reimbursement system (Weissert, 1991). Again, the fragmentation of funding has resulted in a disabling fragmentation of delivery of care (Kane and Kane, 1987).

The outlook for home-care research may improve as we develop more refined instruments for determining who should get it, what type of care and how much should be provided, and what the goals of the program should be. While not yet fully evaluated, new approaches have shown promise for integrating acute and long-term care, even in the home setting (Wiener and Skaggs, 1995). Home care has become more efficient and shows the potential to break even or control costs (Weissert, 1991). Evaluation has been limited to cost-related outcomes, and other appropriate outcomes, such as informal caregiver relief and effect on family life are increasingly receiving attention.

For home-based telemedicine to succeed, we must address the issues of targeting and screening, in addition to a range of organizational and technical issues. Such issues must be resolved before we will be able to evaluate the true effects telemedicine in the home health care. Early telemedicine research in nursing homes (Mark, 1976) offered a promising outlook. Telemedicine's immediate potential may be greatest for improving nursing home care, in bridging the physical and professional divide between the acute and long-term care sectors, and thereby diminishing long-standing recalcitrant problems in health service delivery for disabled and chronically ill individuals.

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APPENDIX B

The Evaluability Assessment

Evaluability assessment is the first step in the development of a comprehensive and systematic methodology to determine the benefits and costs of the home-based telemedicine system. Indeed, in view of the fact that project aims during the first year of operation were limited to the design, development and testing of a technological system at limited military and civilian sites in Georgia, evaluability assessment was the only serious and meaningful type of evaluation that can be performed, in addition to the documentary evaluation presented elsewhere in this report. Given the multi-institutional, collaborative nature of this project and the dynamics of changing technologies and team membership, this assessment is particularly useful in informing program evaluation.

The primary purpose of the evaluability assessment was to frame the research questions and identify the research methodology appropriate for the ultimate summative evaluation to be conducted in subsequent stages of this or other projects of a similar nature. We report here the findings from the evaluabilty assessment, which was conducted in June and July of 1996.

The specific objectives of the evaluability assessment were to identify the: (1) research questions and issues to be pursued in the project's final outcome evaluation; (2) appropriate methodology and data requirements for a credible evaluation; (3) obstacles faced during the implementation stage; and (4) convergence of views among the key participants in this project. To this end, key stakeholders in this project were interviewed about their perceptions of and expectations for the project. Respondents were asked open ended question regarding :

- program's objectives
- project's obstacles and means of resolving them
- focal issues for the final evaluation to address
- the form of data considered most credible

Methodology

Stakeholders in the EHC project were identified by project officers. The list of desired respondents included a total of 13 individuals representing the Center for Total Access, Forts Gordon and Detrick, at Georgia Institute of Technology (GIT), and the Medical College of Georgia (MCG). Administrators, clinicians, researchers and technicians were included. Their names and affiliations are attached to this document.

The majority of the interviews (9 out of 13) were conducted in-person on a face to face basis. In a few instances (4 out of 13), it was not possible to complete these interviews in-person, and a telephone interview was conducted. On average, interviews lasted about 36 minutes. The average duration of in-person interviews was 39 minutes, whereas the average for telephone interviews was 25 minutes. All respondents were provided a list of the questions prior to the actual interview.

The questionnaire was composed of 12 open-ended questions. At the outset, participants were assured confidentiality of their individual responses, and they were encouraged to be candid and to provide complete explanations of their views. The purpose of the survey was to represent the range of opinions regarding the evaluation of the project rather the specific agreement or disagreement with specific points or issues.

Consistent with the purpose of the evaluability assessment, data analysis was fairly straightforward. It was limited to a descriptive presentation of the range of opinions and perceptions regarding each question. In few instances, and where it seemed appropriate, responses were analyzed by respondent affiliation. Since there were several respondents from each institution, this analysis did not reveal the identity of the respondents, and hence, it did not violate the pledge of

confidentiality. Such analysis by affiliation was deemed appropriate only when it helped clarify the variation in perspective among the participating organizations.

A complete transcript was prepared for each interview, regardless of whether it was conducted in person or on the telephone. Individual identities of respondents were encoded at that stage to assure confidentiality, and no names were retained in the files. The only identification was institutional affiliation and function on the project, as follows:

- Medical College of Georgia - Clinical
- Medical College of Georgia- Administrative
- Fort Gordon
- Fort Detrick
- Georgia Technology Institute.

For purposes of this analysis, MCG clinicians were separated from administrators to ascertain potential differences in perspective between them.

Findings

The questionnaire contained questions dealing with respondents' familiarity with the project; the nature of their involvement in it; their views regarding its primary objectives and the kind of health care problems the project is designed to address; their perceptions of obstacles facing its implementation and how they might be resolved; and finally the research questions the evaluation should address, the nature of the findings from such research, and the appropriate research designs to produce credible findings. this report is organized according to these issues, and it presents the range of opinions given by the respondents who constitute the key stakeholders in this project.

Familiarity

Generally, the respondents were quite familiar with the project, as expected (Table 1). Only one person described his familiarity as being only partial, as he was not directly involved in either the development or deployment of the project. The remaining twelve respondents were evenly divided between those who reported having rather "complete information" in all its aspects and those whose information was "complete" but only within their domain of interest. The latter viewpoint was generally expressed by clinicians, as compared to all others in the project.

Table 1
Familiarity with the project

Familiarity	Number of responses
Has complete information	6
Complete information within domain of interest	6
Has partial information	1

Nature of Involvement

The respondents fall into four non-mutually exclusive types of involvement with the project (Table 2). The most frequently mentioned type of involvement was administrative / oversight. Next most common mode of involvement, mentioned by almost half of respondents, was proposal drafting and preparation. Having a clinically-oriented involvement was mentioned by three individuals, and

one person's involvement consisted largely in terms of assessing the project's strategic value for the institution with that individual is affiliated.

Table 2
Nature of Involvement

Involvement	Number of Respondents
Administrative/oversight	9
Proposal preparation	6
Clinical	3
Strategic value	1

Primary Objectives

The objectives of the project are identified explicitly in the proposal. Respondents were queried about objectives in order to determine the extent to which there is agreement about them. Over half of the respondents stated that a primary objective of the EHC project was to conduct a "proof of concept" or feasibility assessment (Table 3), "to see if the technology works." Some respondents provided additional clarification regarding these objectives. One emphasized that "the central goal was to develop, implement, and test a cable-based 2-way audio/video system with peripheral diagnostic units in 25 homes and a nursing home." One respondent explained that the objectives were scaled back, from "testing the practicality of sustaining a network..." to a simple demonstration of feasibility, "does it work? Is it easy for the nurse to call patient during connection period? Is there faithful, reliable transfer of data?" Hence, the project will not determine the impact of home-based telemedicine on patient care. Another respondent clarified that this is a pilot project with a limited set of objectives, as follows: "(1) To determine the potential role of this system in enhancing provider-patient communication and in reducing episodes of illness and health decrements among high risk people (revolving door patients); (2) define minimum system parameters in terms of technical requirements; (3) develop a system for nursing homes to provide systematic care with adequate medical supervision that would reduce the number of ER visits.."

The four stated objectives were cited as important project deliverables. Additionally, health delivery and policy objectives were described, largely by clinicians. Cost-effectiveness was the most widely reported health policy objective. Other health delivery objectives included improved access, communication, compliance, quality of life, and, in general, preventing health decrements. One respondent explained the objective succintly: "to demonstrate the feasibility of utilization of an in-home telemedicine system for management of patients who are high users of medical care and to determine if the system can decrease runs to the hospital."

Table 3
Project Objectives According to Respondents

Objective	Number of Respondents
Feasibility/proof of concept	9
Explicit objectives in proposal	4
Health delivery	
improve access, quality of care, quality of life, compliance	13
cost-effectiveness	8

Health Care Problems the Project is Designed to Address

Respondents were asked to take three distinct perspectives in considering the kinds of health care problems the project addresses or is designed to address. The perspectives were those of clients, providers, and payers.

Client Perspective: There was unanimous agreement among the respondents regarding the significance of the project for clients. They believed the project addresses the need for frequent monitoring, especially for patients with chronic conditions requiring frequent attention by providers. Next in importance is the related need for reassurance, psycho-social support and guidance from a health care professional. One respondent noted that telemedicine equipment in public places could have a utility comparable to the ATM (automatic teller machine) used in banking.

A slight divergence in perspective was expressed by one respondent who felt that consideration of health care problems was not central to the project, since the focus during the preliminary phase was limited to designing technical parameters for conveying clinical information. However, the same respondent explained later in the interview that access, quality, and costs should be part of the evaluation, that these issues could have been incorporated into this section.

Provider Perspective: Overall, respondents did not differentiate between the perspectives of providers and clients. Instead, they emphasized that problems addressed by this system relate to maintaining chronically ill patients at home, or in nursing homes, thereby reducing ER visits and hospitalization. Typical responses were: "keep people healthier longer... more efficient treatment of patients...bringing patient and provider together at the right time and place...maintain wellness and stability without transporting care to home or patient to care...give patient education, monitor compliance, get patient to feel better in home setting.." Some respondents emphasized that problems addressed are "in line with those from the clients' perspective." More specifically, these include keeping patients healthier and out of the hospital as well as enabling providers to anticipate problems before they get too serious.

Saving money was another theme mentioned by several respondents, but primarily in terms of "keeping revolving door patients out of the hospital... working with post-operative patients... achieving shorter length of stay and quicker discharge... shift provision from costly to less costly care." This goal would be achieved by means of early intervention, greater appropriateness of utilization, preventing costly utilization, and enabling shorter lengths of stay in acute care facilities.

A related set of responses had to do with increasing the amount and quality of health care information. It was suggested that telemedicine might aid providers in several ways, such as a better understanding of the patient's home setting, better monitoring of compliance and of patients who often go un-visited by highly trained providers; and it would facilitate more effective patient education and data collection.

Finally, two respondents emphasized the limitations of the present project to technological feasibility. If, however, feasibility is shown, then providers will see it as having potential for intervention and quality improvement.

Table 4
Provider Perspective on Problems Addressed by Project

Problems addressed	Number of Respondents
Maintain patients' health, prevent health decrements	9
Improve efficiency, reduce inappropriate use	7
Improve providers' knowledge of home situation, improve compliance	4
Technological feasibility	2

Payer Perspective: There was total consensus among the respondents regarding problems addressed by the project from the payers' perspective (Table 5). All respondents reported lowering or containing costs as the main problem. There was general agreement also regarding the means of lowering costs. These included improved health, shifting care to less costly locations and modalities, and increased appropriateness of care.

One respondent explained the relationship between the various perspective of clients, providers, and payers by suggesting that improved access (for patients) and improved quality (for providers) are achieved while containing overall cost of care, all this despite the fact that "it will cost money up front" to establish the system. Some respondents assumed a wait and see attitude by raising questions that should be answered with data. "Is high equipment cost going to offset expensive ER visits and hospitalization? How do you decide for which set of patients it will be cost-effective?"

Table 5
Payer Perspective on Problems Addressed by Project

Problem Addressed	Number of Respondents
Cost containment	**13**
Means of containing cost:	
reduced hospitalization, quicker discharge, shorter length of stay	5
care in less expensive location	3
preventive care	2
reduce transportation cost	2
reduce referrals, unnecessary use	2
improve patient health	1

Obstacles

The next set of questions pertained to perceived obstacles facing the implementation of the project and achieving its explicit objectives as well as suggested ways of dealing with them. Summary findings are presented in Table 6.

Most of the respondents cited technological difficulties in getting the project started. Some explained the complexity of the technological design which employed several off-the-shelf technologies. Each of these technologies has worked well on its own, but have not been tested before as essential components of an integrated system. One respondent explained, "five pieces of technology that work on their own won't necessarily work together. If it had been done from scratch, there would have been fewer problems with implementation, but we wouldn't have learned as much." The cable systems that were used were old and "noisy" [have interference], "modems could not handle static." The use of cable-based connections and off-the-shelf equipment has proved problematic. These technical problems were viewed as significant barriers to getting the project moving and in encountering false expectations.

In addition to technological difficulties, the majority of the respondents perceived organizational and logistical difficulties arising from differences in culture among the participating organizations. While organizational problems were cited by several respondents, one explained the nature of the difficulty as follows: "This [project] was a coalition of three organizations with at least three cultures [ways of doing things]. The steering committee tried to establish a common framework among the participants, and sometimes the members of the committee agreed to disagree." Others mentioned the difficulty of establishing collaboration among institutions whose cultures are different from each other. "It is very difficult to get agreement and progress." Changes in personnel on all sides, lack of long-term funding, and obstacles to communication between MCG

and Fort Gordon, and to a degree, between MCG and GIT. The respondent explained that these difficulties "slowed and diluted the project."

Some respondents indicated that it was difficult to establish an effective framework for decision making and effective management of the project. It took time to establish trust among the constituent members. The mere geographic dispersion of team members has also contributed to teamwork problems. A related problem is how to establish the intellectual rights for the results of this collaboration.

Short term funding was cited as a significant obstacle for achieving project objectives, given the complexity of the task at hand. More time was needed. Technological problems had to be fully resolved before the project can collect reliable and valid data regarding provider and client acceptance, clinical effectiveness, and cost-effectiveness. Patient acceptance of and training with telemedicine also were viewed as possible obstacles.

Two project design issues were raised. One was the potential of nurse training to be a confounding variable, since the project includes both registered nurses and nurse practitioners. The other design issue is that the project may be limited in getting significant results because the nursing stations are not staffed 24 hours per day. Instead, they are presently staffed only from 9:00 AM to 5:00 PM. However, "patient conditions of an acute nature might present themselves at other times. We could staff more hours and get more results." One respondent explained, "the nursing home part of the project has a very high chance of achieving significant success since nursing home costs are so high."

One respondent emphasized that the time frame for the entire project was too brief. The process involving the technological design, equipment selection, system testing, and system operation could not be completed within a single year. Hence, the project was based on false expectations from the start.

Table 6
Perceived Obstacles in Implementing Project

Obstacle	Number of Respondents
Technological difficulties	13
Organizational issues; Differences in culture	7
Provider issues	6
Short term funding	6
Short time frame	1

Resolution of Obstacles

Having described the project's obstacles, respondents were asked how these issues might be resolved or at least diminished. Their responses are summarized in Table 7.

Everyone agrees that the initial technological problems that beset the project are being resolved. To speed this along, the cable company might be given financial incentives to reinstall new cables. As well, other systems should be investigated, including ISDN, telephone and wireless. While one respondent declared it partly desirable to push the technology envelope, another said it

might be necessary to wait for the technology to mature, or to settle for a lesser solution which suffices for the present.

Regarding inter-organizational teamwork problems, respondents again felt that progress has been made. Several respondents explained that it takes time to establish an effective working relationship among such diverse partners; team work should have started earlier. Some suggested that greater clarity with regards to the project objectives and greater interaction among team members would have facilitated the process. Collaboration of this sort requires trust and commitment on all sides. Other approaches focused on the structure of collaboration: less linear task reporting, putting a single investigator in charge. One respondent's remedy was to become far more directive and proscriptive.

Funding limitations would be remedied by demonstrating that the project has achieved its stated objectives and by applying for additional funds, perhaps from other sources, to complete the long term objectives of the project. Provider acceptance could become another research goal. Patient training issues merit further work on the consumer approach, though this was considered outside the scope of this project.

Other suggestions included: developing a vision of what is feasible (doable) within the limited time frame and be honest about it; demonstrating that the project had actually achieved its explicit objectives; keeping a high level of commitment; stressing patient education; promoting provider acceptance; improving the overall working relationship between the Medical College of Georgia and Eisenhower Medical Center; focusing on effects of the system on patient care and assessing its cost-effectiveness; and finally, increasing the staffing hours for the nursing stations. Using only nurse practitioners is a design issue which one respondent felt we should be adamant about.

False expectations may be diminished if the participants are candid with each other and realistic about their goals. This would require setting up a clear agenda and pursuing it aggressively as well as establishing greater coordination among the participating organizations with clear lines. One respondent suggested assigning a single project director to assume full responsibility for all project operations. Finally, several suggested that more time is needed for completing this worthwhile project.

Table 7
Resolution of Obstacles

Resolution	Number of Respondents
Technology Issues	
Resolution underway	7
Investigate non-cable systems	3
Influence cable company	2
Push technology envelope	1
Use mature technology only	1
Organizational Issues	
Increased interaction, team building earlier	4
Establish clear agenda	2
Increase trust, less territorial, address institutional differences	2
Single investigator in charge	1
Clarify intellectual property	1
Less linear reporting	1
More directive approach	1
Resolution underway	1
Funding Issues	
Apply for more funds	3
Extend project	1
Seek other sources	1
Demonstrate achievement	1
Provider Acceptance	
Establish as research goal	3
Will result from experience	1
Patient and Public education	
Stress benefits	2

Research Questions That Respondents Would Want the Evaluation to Answer

One of the critical objectives of this evaluability assessment was to determine the research questions to be addressed in the long run. Hence, respondents were asked "what research questions would you want the evaluation to answer?" The responses were diverse and covered a wide range of issues. These issues are classified into seven basic categories here to simplify their presentation, as shown in Table 8. Again, we begin with the most widely mentioned categories.

Patient and provider attitudes and perceptions are considered important topics for evaluation. More specifically, "how satisfied were patients and providers with the telemedicine communication? How patients felt about using the system? Was it easy, unobtrusive, or supportive? Whether

explanations of use of equipment were clear and understandable? Were patients' needs met?" "Were providers satisfied with the communication?" In terms of nursing homes, "how do nursing home staff and patients accept this?" "Can physicians really trust technology?"

Health care and the utilization of services is the next broad category of interest. A wide range of issues was proposed, such as the appropriateness of prescriptions, the extent of hospitalizations, and shifts in hospital resources utilized. Respondents were also interested in the impact on the medical care process. For instance, "what is the impact on patient-provider interactions, on compliance, and quality? "Can multidisciplinary interactions with patients be appropriately provided in the home with telemedicine?"

Project feasibility is the next most frequently mentioned set of responses. This refers to technical and clinical reliability. Respondents were interested in evaluating the limits of technology and the communication speed threshold necessary for user acceptance. "How much technology is enough?" "What are the limits of technology?" Lastly, in this category, is the question of the degree to which this project may be scaled to a larger number of users.

Respondents were interested in evaluating the project's impact on client health. Research questions to pursue in this regard include mortality differences, the likelihood of exacerbations of symptoms, and whether the project would bring a reduction in the 'revolving door' quality of some patients? "When is telemedicine worth it?"

Cost-effectiveness of the project was mentioned as an explicit concern. For example, what is the economic impact of the project, and was care shifted to a less costly modality? Will earlier intervention result in cost savings? " Can we raise access without dramatically raising costs?" Finally, what technical capacities could be changed as a means of increasing savings (e.g., if patients had internet access)?

The process of research was also offered as a research topic. These included questions about the cultural changes required for success, among providers and among institutional partners. Another avenue of inquiry was whether an academic-military collaboration is a superior means of developing a device with these capabilities than would going to the commercial market.

One respondent noted that issues of confidentiality and ethics in telemedicine are of interest. Finally, a single respondent reported that Vector Research, Inc. should be contacted, as they will get involved in the evaluation of this project, since the Department of Defense is involving them in its projects.

Table 8
Research Questions Evaluation Should Answer

Research Questions	Number of Respondents
Patient and Provider Attitudes	
Patient satisfaction/acceptance	8
Provider satisfaction/acceptance	5
Psychological impact	1
Impact on Care/Utilization	
Quality of care	7
Access to care	4
Cost of care	3
Doctor/patient relationship	3
Feasibility	
Technical feasibility; configuration	5
Technical reliability	4
Clinical reliability	3
Scalability, technical limits	1
Cost-effectiveness	7
Impact on health	6
Cultural change	2
Confidentiality	1

When Completed, What Would Want Evaluator To Be Able To Say

In order to ensure that all important issues are covered with regards to research questions, respondents were asked "When the entire project is completed, what would you want the evaluator to be able to tell you?" Here again, a wide range of responses was given. And again, in order to simplify the presentation the responses were grouped into sets, as shown in Table 9.

The majority of the respondents considered cost-effectiveness as high priority for evaluation. This was followed by care outcomes, technical and clinical feasibility, patient and provider acceptance, and overall utility (in that order).

The issue of cost and cost-effectiveness was mentioned by a large number of respondents. Specifically, they wanted to know about the cost-effectiveness of the intervention [in-home telemedicine and nursing home telemedicine]; impact on health care utilization costs; overall costs; and cost implications of using physician extenders. There was a specific interest in cost as well as quality implications of nursing home telemedicine because it was feared that home-based telemedicine may not prove to be cost-effective. One respondent noted that it was not one of the project's stated goals, "assessment of cost effectiveness would be nice."

Several respondents expressed interest in finding out whether the project has made a difference for patient care and patient health outcomes. One respondent noted that [by virtue of the limited time frame for this project] we may be unable to collect considerable patient care data, "we are at least interested in showing that telemedicine does not have a negative effect on patient care." Another respondent said, "we need to know what is the impact of the system on the patient's quality of life, health care utilization costs, and patterns of use?"

The next set of issues mentioned by the respondents related to technical and clinical feasibility. Respondents would like to know whether the project's system and individual pieces were reliable, capable of consistently establishing and maintaining connections? "Would the system be clinically feasible for high-risk patients? Would it enable accurate transfer of patient information?" One respondent was interested in determining the system's potential as a diagnostic tool, while another stressed that the project should be limited to providing therapeutic information, and assessing its diagnostic potential goes beyond the project's scope.

Several individuals mentioned that the evaluator should inform them regarding the acceptance of telemedicine by clients and providers. They were also interested in whether the project has utility from the patient and provider perspectives. "Are logical follow-ups to this project worthy of the expense?"

One individual offered that project evaluators might be able to provide useful information about how to establish a virtual team, and how to use technology more efficiently for organizational and administrative purposes.

Three respondents noted that the current data will be limited, and that some desirable information may not be available. It may not be possible to evaluate the economic and qualitative merits of telemedicine, to make pre- and post- comparison, or to show project impact in individual homes.

Table 9

What Should Evaluator be able to Explain

Issue to be Explained	Number of Respondents
Cost-effectiveness	7
Care outcomes	6
Technical and clinical feasibility	5
Client and provider acceptance	5
Overall utility	3

Research Design To Be Utilized To Make Findings More Credible

The focus of this project was initially to both develop and validate telemedicine technology. Several respondents noted that current goals are more limited than they were at the start, and the project is constrained in terms of specific effects that can be demonstrated (Table 10).

The responses given to this question covered a variety of issues including not only research design but also research questions and other technical matters. Those who answered the question directly offered a number of significant suggestions. These included prospective experimental designs with comparable control group and sufficient time for observation; pre- and post- test design

using a "visual analog scale"; comparison of in-person and telemedicine patient evaluations; survey of providers; and historical comparisons for nursing home patients. An interesting approach suggested was a comparison of virtual and non-virtual provider-patient encounters.

Almost all respondents suggested that qualitative measures be included in this research. Among these were pre- and post-test comparisons of visual analog preference scales and of patient and provider expectations; open-ended reports of the experiences of users; and content analysis of videotaped telemedicine encounters.

About half of all respondents emphasized the importance of empirical, as compared to anecdotal, data. One participant emphasized that the project should demonstrate cost savings in health care delivery on the basis of statistical rather than rely solely on anecdotal evidence. Analysis should assess health care utilization before and after the introduction of telemedicine.

One respondent commented that the military has its own approach to evaluating the medical care process, and that this approach should be investigated. Another respondent referred us to Vector Research, Inc.

Table 10

Research Designs For Credible Findings*

Feasibility study

- Won't assess feasibility of having telemedicine an all homes in US
- Can we deliver home monitoring that can meaningfully affect health care
- Nature of reliability

Research designs

- **Clinical scenarios (compare virtual and non-virtual exams)**
- **Comparison of patient evaluations made in-person and via telemedicine**
- **Pre- and post-test**; visual analog scale; "was it as good as a 'real' doctor?"
- **Pre- and post-test of patient and provider expectations**
- **Survey providers, did patient improve**
- **Prospective experimental design; control group with similar type patients compared to this group; compare differences over time; allow sufficient time period**

Qualitative data

- Analyze themes in responses, examine videotaped patient interviews
- Assess need for intervention
- Patient acceptance
- Likes and dislikes; use open-ended questions
- Patient attitudes
- Patient perceptions of the device
- Is the patient reassured
- Perceived meaning, experience in home, experience of hospital staff initiating contact to one's home
- Quality of life -- is it improved by having device in the home

Quantitative data

Demonstrate statistically that there are savings in health care delivery; want real numbers, not physician testimony

Empirical, not anecdotal

Historical comparisons for nursing home patients

Utilization patterns before and after telemedicine

Need to investigate how the military evaluates the medical care process

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* Number of respondents not given here because of wide dispersion

Additional Comments by Respondents

At the conclusion of the interview, several respondents provided additional comments that were not reported elsewhere during the interview. Some of this volunteered information is worth reporting here. For example, one clinician remarked that the project was extremely slow to start, and the hold-up created serious problems. This respondent explained further that technical problems should have been resolved before bringing in the physicians. The same theme was repeated by another respondent, although this latter individual expressed frustration about the process from the perspective of the engineer, noting that unclear clinical requirements had led to back-steps. Hence, the clinician was saying that the technology has to be in place and operating smoothly before physicians are involved, and the engineer saying that clinicians had to specify clinical requirements before the system can be built.

A non-military respondent commented that there was frustration in the army regarding the pace of university research, and that private industry might achieve results sooner. The implication here is clear. This view was reinforced by a military respondent who indicated that there was frustration within army management regarding the project which may account for placing it on "the back burner."

One respondent captured the sense of many respondents regarding the merit of the project and the frustration with its slow pace. This individual said, "the concept is great... the test of feasibility is significant... if only we can get our act together and do it."

When asked about the evaluability assessment, respondents either had no comment or were rather positive about it. That is, among those who expressed an opinion regarding the merit of the evaluability assessment, everyone liked it. Examples of favorable comments include: "Glad to see it's happening... good to see an independent assessment... important, has to be done. From the Army's perspective, the information is important, and it should have been done earlier and repeated periodically. It could have brought issues to the fore, particularly regarding cultural differences [among the collaborators] ... very comprehensive, well done."

Descriptive Statistics Regarding Interviews

Total number of interviews: 13

Mode of interview

In-person:	9
Phone:	4

Average length of interview: 36 minutes

Length of interview, by mode of interview

In-person:	39 minutes
Phone:	25 minutes

Average length of interview, by institution

Military (Fort Gordon and Washington, DC, locations)	28 minutes
Academic	43 minutes
Clinical	43 minutes
Admin	42.5 minutes
Technical	**45 minutes**

APPENDIX C

Membership Roster- Electronic House Call Project Steering Committee

Mrs. Laura N. Adams, Director of Operations, Telemedicine Center, Medical College of Georgia

Dr. Betsey Blakeslee, Telemedicine Liaison, U.S. Army Medical Technology Management Office, Ft. Detrick

Mr. Michael Burrow, Acting Director, Biomedical Interactive Technology Center, Georgia Institute of Technology

Dr. Kevin Grigsby, Director of Research and Development, Telemedicine Center, Medical College of Georgia

Mr. Jack Horner, Executive Director, Center for Total Access, Fort Gordon

Mr. John Peifer, Senior Research Scientist, Biomedical Interactive Technology Center, Georgia Institute of Technology

Dr. Daniel Rahn, Vice Dean for Clinical Affairs, School of Medicine, Medical College of Georgia

Ms. Loretta Schlachta, Regional Nursing Consultant, Center for Total Access, Fort Gordon

Dr. Max Stachura, Clinical Director, Interim Director, Telemedicine Center, Medical College of Georgia

Mr. James C. Toler, (Chairman), Co-Director, Georgia Tech/Medical College of Georgia Research and Education Program Center, Georgia Institute of Technology

Dr. Daniel Ward, Center for Total Access, Fort Gordon

	Steering Committee				
Ms.	Adams, Laura	706-721-6616	Dr.	Rahn, Dan	706-721-8037
Dr.	Blakeslee, Betsey	706-754-5655	Dr.	Sanders, Jay (Ex Officio)	706-721-6616
Mr.	Burrow, Mike	404-894-7034	Ms.	Schlachta, Loretta	706-787-2381
Dr.	Grigsby, Kevin	706-721-6616	Dr.	Stachura, Max	706-721-6616
Mr.	Horner, Jack	706-787-2381	Mr.	Toler, Jim	404-894-3964
Mr.	Peifer, John	404-894-3964	Dr.	Ward, Dan	706-721-3332
	Sub-Committees				
	Technical			**Operations / Administration**	
Mr.	Burrow, Mike	404-894-7034	Ms.	Adams, Laura	706-721-6616
Mr.	Colwell, Vince	706-787-2381	Ms.	Brown, Ann	706-721-6616
	Searle, John	706-721-3161	Mr.	Horner, Jack	706-787-2381
Dr.	Stachura, Max	706-721-6616	Mr.	Peifer, John	404-894-3964
MAJ	Teece, Bill	706-791-3069			
Dr.	Ward, Dan	706-721-3332			
	Clinical			**Research / Evaluation**	
Dr.	Guill, Lou	706-721-2635			
Dr.	Jackson, Tom	706-721-2633	Dr.	Bashshur, Rashid	313-936-1317
Dr.	Rahn, Dan	706-721-8037	Dr.	Blakeslee, Betsey	706-754-5655
LTC	Schlachta, Loretta	706-787-2381	Dr.	Grigsby, Kevin	706-721-6616
Dr.	Stachura, Max	706-721-6616	LTC	Schlachta, Loretta	706-787-2381
Mr.	Toler, Jim	404-894-3964	Mr.	Toler, Jim	404-894-3964
Dr.	Ward, Dan	706-721-3332			

revised 1/24/96

Electronic House Call Project
Steering Committee Meeting
October 19, 1995
2:00 pm

The first meeting of the Electronic House call Project Steering Committee was held on Thursday, October 19, 1995 at 2:00 pm in the Telemedicine Center Conference Room.

Members Present	**Institution**
Mrs. Laura Adams	Medical College of Georgia
Mr. Mike Burrow	Georgia Institute of Technology
Dr. Kevin Grigsby	Medical College of Georgia
Mr. John Peifer	Georgia Institute of Technology
Dr. Max Stachura	Medical College of Georgia
Dr. Jim Toler	Georgia Institute of Technology
Dr. Dan Ward	Eisenhower Army Medical Center

Members Absent	**Institution**
Dr. Betsey Blakeslee	Eisenhower Army Medical Center
Dr. Dan Rahn	Medical College of Georgia
Mr. Jack Horner	Eisenhower Army Medical Center

Other Attendees: Mrs. Ann Brown, Recorder

Dr. Grigsby informed the group that all committee members must make a conflict of interest disclosure if they are stockholders, family or board members, or consultants for any of the following corporations: Silicon Graphics, Imagelink, Jones Intercable, or AND Interactive. No present members provided such disclosure.

The group elected Mr. Jim Toler as Chair for a one year period. A discussion to define quorum resulted in the adoption of the following policy: One person from each institution and a minimum of six persons must be present for each vote. A 2/3 vote is needed to pass a motion.

Mrs. Ann Brown was appointed as the Executive Secretary for the committee.

The committee decided that it will be called "Electronic House Call Steering Committee," although the project includes four major tasks. The committee will function as follows: "Under the terms of the cooperative agreement, the steering committee is responsible for the overall management of the project. This is accomplished through development, adoption, and implementation of policy as related to tasks 1-4." Day to day decisions will be made by working groups, or subcommittees, which will be charged with tasks to accomplish. The subcommittees will report problems to the steering committee. The committee also adopted the following

statement: "The committee will meet all state, federal, local, and governmental regulations to the cooperative agreement."

Mr. Burrow suggested looking at working groups which had been discussed at a previous planning meeting. Dr. Ward indicated that his plan in suggesting these working groups was to involve other people such as Signal Corps experts in order that the product will be suitable for the Army as well as the other institutions.

Dr. Grigsby suggested naming four working groups which would cover all four major tasks. His suggestions were: Technical, Clinical, Research/Evaluation, and Operations/Administration working groups. Some of the tasks will incorporate more than one working group.

Dr. Ward asked if SGI would still be asked to provide 15 units. He said this was requested in the proposal, but now the decision has been made to go with a desktop system. Mrs. Adams indicated that this type of decision should be up to the technical subcommittee.

Mr. Toler indicated that he believes the Washington D.C. demonstration kiosk will be replaced by a video which is being produced by Georgia Tech.

Mr. Peifer suggested that some of the goals may have changed. Under the cooperative agreement, some of the sponsor's ideas may be implemented. He suggested extracting all the tasks from the proposal. The group decided to name members of the four working groups and then discuss which tasks each working group would develop. The subcommittees were adopted as follows, with a steering committee member from each institution on each subcommittee along with other recommended experts:

Operations/Administrative

- Mrs. Laura Adams
- Mr. Jack Horner
- Mr. John Peifer
- Mrs. Ann Brown

Clinical

- Dr. Max Stachura
- Dr. Dan Ward
- Dr. Dan Rahn
- Dr. Lou Guill
- Dr. Tom Jackson
- Mr. Jim Toler
- LTC Loretta Schlachta

Technical

Dr. Max Stachura
Dr. Dan Ward
Mr. Mike Burrow
Dr. John Searle
MAJ Bill Teece

Research/Evaluation

Dr. Kevin Grigsby
Dr. Betsey Blakeslee
Mr. Jim Toler
LTC Loretta Schlachta

Mr. Toler will be an ex-officio member of all subcommittees. Individual subcommittees will appoint a chair and will provide a report to the steering committee.

The committee reviewed the proposal and assigned tasks to the appropriate working group as follows:

Task I: Administrative/Operations
Task II: Technical, Research//Evaluation, and Clinical
Subtask 1 - Administrative/Operations
Subtask 2 - Technical
Subtask 3 - Research/Evaluation
Task III: (GA Tech) Administrative/Operations
Task IV: Technical (with Clinical and Research components)

Discussion ensued regarding the home units and FDA approval. Dr. Grigsby told the members that he went to Oxford to meet with the FDA and learned the following:. Some standards need to be met. If the project is using technology for a means of communication, it does not need FDA approval. If it goes beyond communication to measuring elements, then the line is crossed. Mrs. Adams suggested that the technical subcommittee take the lead in this investigation.

Dr. Stachura asked about Human Assurances. Dr. Grigsby responded that we are not cleared to use this device in homes and to test it. We will have to address the HSA along the way. The research/evaluation subcommittee will apply for this. He would like to have reciprocity of approval for Institutional Review Board decisions with MCG and Georgia Tech.

Dr. Grigsby made a motion to invite the PI (Dr. Jay Sanders) to be an Ex Officio member of the Steering Committee for the duration of his tenure with MCG (or any other of the three institutions.) The motion was unanimously approved.

Dr. Stachura recommended a day at any of the institutions for all subcommittee members to have a general meeting, break into subcommittees, and then meet back together for 20 minutes to discuss the outcomes. The motion was seconded and approved.

Dr. Grigsby announced that subcommittee members will be subject to the conflict of interest disclosure regulations as well.

Dr. Ward asked for clarification on what has already been agreed to. For example, has the decision been made to use a P.C. based system?

Dr. Grigsby answered that any decisions must be voted upon by the steering committee. Dr. Grigsby suggested that the committee members share the burden of traveling between institutions for meetings.

A date of October 31 was decided upon for the meeting. It will be held at the MCG library from 8:00-2:00 pm, and lunch will be served.

Mr. Burrow asked that the Steering Committee entertain one decision today. The script for the video production must be approved for the filming to be conducted this month. The motion was made and seconded, and the motion carried.

The meeting was adjourned at 4:10 pm.

Respectfully Submitted,

Ann H. Brown, MHSA
Recorder

To: Everyone, Plus
From: E-MAIL POSTMASTER (E-MAIL POSTMASTER)
CC:
Subject: Conflict of Interest Policy
Date Monday, October 16, 1995 7:25 AM

To: Faculty and Staff

From: J. Malcolm Kling, D.V.M., Ph.D., Interim Vice President for Research

A new Conflict of Interest Policy that went into effect October 1, 1995 places additional information reporting requirements on investigators involved in extramurally supported grants and contracts. The new policy is mandated by recently enacted Public Health Service and National Science Foundation regulations.

There is a new section on the Office of Grants and Contracts Grant/Contract/Agreement Routing Form "purple routing sheet" that investigators will have to complete and sign as part of the financial conflict of interest disclosure process. Investigators who have significant financial interest in relation to the proposed activity are required to submit a "Disclosure of Significant Financial Interest" form to the "responsible representative of the institution," who generally is the investigator's department chair.

Faculty can obtain copies of the Conflict of Interest Policy and disclosure forms from their departments. The Office of Grants and Contracts and the Legal Office also have copies of the forms and the policy. The policy is posted on the MCG World Wide Web server (address http://www.mcg.edu) under the heading "Research Policies" in the "Grants and Contracts" section.

MEDICAL COLLEGE OF GEORGIA
CONFLICT OF INTEREST POLICY

PURPOSE

To (1) ensure the integrity and objectivity of the research and other scholarly activities of MCG employees through the disclosure and management of financial conflicts of interest and (2) ensure compliance with state laws prohibiting certain transactions with state agencies.

As used in this policy, "Conflict of interest" means any situation in which (i) it reasonably appears that a significant financial interest could affect the design, conduct, or reporting of activities funded or proposed for funding by a sponsor, or (ii) the personal interest of an employee or his or her family may prevent or appear to prevent the employee from making an unbiased decision with respect to the employee's employment with the institution including, without limitation, situations when the employee or a member of his or her family has a significant financial interest in a business which competes or may compete with the Medical College of Georgia.

I. DISCLOSURE OF SIGNIFICANT FINANCIAL INTEREST

A. Definitions

1. "Investigator" means the principal investigator, co-investigator, and any other person (e.g., post-doctoral fellows) at MCG who is responsible for the design, conduct, or reporting of research or scholarly activities funded or proposed for funding by a sponsor.

2. "Responsible representative of the institution" means:

   a. Department Chair for faculty and other departmental personnel meeting the definition of investigator;

   b. Dean for Department Chair;

   c. Vice-President for Academic Affairs for Deans and other Vice-Presidents; and

   d. President for Vice-President for Academic Affairs.

3. "Significant financial interest" means anything of monetary value, including, but not limited to, salary or other payments for services (e.g., consulting fees or honoraria); equity interests (e.g., stocks, stock options or other ownership interest); and intellectual property rights (e.g., patents, trademarks, copyrights and royalties from such rights). The term <u>does</u> <u>not</u> include:

   - salary, royalties or other remuneration from MCG;
   - income from seminars, lectures, or teaching engagements sponsored by public or nonprofit entities;
   - income from services on advisory committees or review panels for public or nonprofit entities; or
   - an equity interest that, when aggregated for the investigator and the investigator's spouse and dependent children, meets both of the following tests: (i) does not exceed $10,000 in value as determined through reference to public prices or other reasonable measures of fair market value, and (ii) does not represent more than a 5% ownership in any single entity; or
   - salary, royalties or other payments that, when aggregated for the investigator and the investigator's spouse and dependent children, are not expected to exceed $10,000 during the next twelve-month period.

B. Disclosure of Significant Financial Interest

Every investigator shall disclose any conflict of interest which arises during the course of his/her employment to the appropriate responsible representative. This disclosure shall be on MCG's "Significant Financial Interest Disclosure Form", a copy of which is attached as "Exhibit A". The Disclosure Form shall be signed by the investigator. A separate disclosure form is required for each project and for each conflict of interest. Every investigator must submit a completed and signed disclosure form to the appropriate institutional representative prior to the time any research grant, contract, or other extramural proposal is submitted for review to the Office of Grants and Contracts. Investigators must also certify that appropriate disclosures have been made and any potential conflicts of interest have been resolved. A certification is included on the standard MCG grant routing sheet and must be signed by the investigator. The disclosure shall be updated by the investigator at any time there is a change in the facts reported in the initial disclosure. If no conflict of interest existed at the time of the initial proposal but such a conflict arises during the course of the project or proposal, the investigator shall file a disclosure of conflict of interest as soon as facts creating the conflict become known to him/her.

C. Resolution of Conflicts of Interest

The responsible representative to whom a disclosure of conflict of interest is made shall review such disclosure and make a determination as to whether or not a conflict of interest exists. The Vice-President for Research may provide assistance and guidance in the resolution and management of any conflicts. A conflict of interest will exist whenever the responsible representative determines that a significant financial interest exists which could directly and significantly affect the design, conduct or reporting of the research or scholarly activities funded or proposed for funding by a potential sponsor. Should a conflict of interest exist, the responsible representative shall determine what restrictions, if any, should be imposed by MCG to manage, reduce or eliminate such conflicts of interest.

By way of illustration, the following conditions or restrictions may be imposed to manage, reduce or eliminate conflicts of interest:

a. public disclosure of significant financial interest;

b. monitoring of research by independent reviewers;

c. modification of the research plans;

d. disqualification from participation in that portion of the research that would be affected by the significant financial interest;

e. divestiture of significant financial interests by the investigator; or

f. severance of relationships that create actual or potential conflicts of interest.

In addition to the restrictions listed above, the responsible representative shall have discretion to impose any other conditions or restrictions which in their judgment would manage, reduce or eliminate any actual or potential conflict of interest and which would be consistent with applicable policies, regulations, and laws.

Should the responsible representative determine that MCG is unable to satisfactorily manage a conflict of interest, the responsible representative shall immediately notify both the investigator and the Office of Grants and Contracts. The Office of Grants and Contracts shall be responsible for notifying the sponsor of MCG's determination.

All decisions made or taken by the responsible representative shall be in writing and shall state the decision, the reasons therefor and any conditions or restrictions imposed. This written decision together with the written disclosure of conflict of interest shall be maintained for at least three years after the later of:

1. the termination or completion of the award to which they relate; or

2. the resolution of any government action involving those records.

The President of the Medical College of Georgia, either directly or through his/her designee, reserves the right to review all decisions regarding management and resolution of conflicts of interest made by a responsible representative. In the event the President determines that the responsible representative's decision is incorrect, inappropriate, or inconsistent with applicable law, the President reserves the right to rescind, modify, or reverse a decision of the

responsible representative.

II. TRANSACTIONS WITH STATE AGENCIES

A. Definitions

1. "Agency" means any agency, authority, department, board, bureau, commission, committee, offices, or instrumentality of the State of Georgia but shall not mean a political subdivision of the State of Georgia.

2. "Business" means any corporation, partnership, proprietorship, firm, enterprise, franchise, association, organization, self-employed individual, trust, or other legal entity.

3. "Employee" means any person who is employed full-time or part-time by the Medical College of Georgia.

4. "Family" means spouse and dependents.

5. "Full-time" means 30 hours of work for MCG per week for more than 26 weeks per calendar year.

6. "Part-time" means any amount of work other than full-time work.

7. "Person" means any person, corporation, partnership, proprietorship, firm, enterprise, franchise, association, organization, or other legal entity.

8. "Substantial interest" means the direct or indirect ownership of more than 25 percent of the assets or stock of any business.

9. "Transact business" or "transact any business" means to sell or lease any personal property, real property, or services on behalf of oneself or on behalf of another party as an agent, broker, dealer, or representative and means to purchase surplus real or personal property on behalf of oneself or on behalf of another party as an agent, broker, dealer, or representative.

B. Prohibited Transactions

No MCG employee shall undertake any activity which constitutes a conflict of interest except as may be expressly approved and/or managed pursuant to the provisions of this policy. Georgia law states that it shall be unlawful for any full-time employee, either for himself/herself, or on behalf of any business, or for any business in which such employee or member of his/her family has a substantial interest, to transact business with the agency which employs him/her. As defined in Georgia law, "agency" would be the Board of Regents of the University System of Georgia and, therefore, this provision would apply to employment by any institution of the University System.

Georgia law expressly allows employees of one unit of the University System to teach or work as a consultant for another unit of the University System provided <u>all</u> of the following conditions are met:

A. The employee in question is a chaplain, fireman, licensed physician, dentist, psychologist, registered nurse, licensed practical nurse, or holds a doctorate or masters degree from an accredited college or university;

B. The president of the University System institution wishing to utilize the services of the MCG employee has certified in writing the need for the services and sets forth why the best interests of the state would be served by obtaining the part-time services of that individual in lieu of obtaining the same services from a person not employed by the state;

C. The President of the Medical College of Georgia has certified in writing that the employee whose services are desired is available to perform such services, that the performance of such services will not detract nor have a detrimental effect on the performance of that person's employment at the Medical College of Georgia, and that the part-time employment of this person would be in the best interest of the State of Georgia.

The certifications described in paragraphs (B) and (C) shall be met by the employee completing and obtaining the necessary signatures on the "University System of Georgia Employee Consultant Agreement Between Institutions" form (See "Attachment B").

The law also provides that full-time employees of the Board of Regents may serve as members on governing bodies of private, non-profit, educational, athletic or research related foundations and associations which are organized for the purpose of supporting institutions of higher education in this state and in which in furtherance of this purpose may transact business with such institutions or with the Board of Regents of the University System of Georgia. Such foundations and associations would include, but are not limited to, MCG Research Institute, Physicians Practice Group, and MCG Foundation. (See, Official Code of Georgia Annotated, 45-10-20, et seq.).

C. **Annual Reporting of Transactions with State Agencies**

Georgia law requires that any employee, whether part-time or full-time, either for himself/herself, for any business or on behalf of any business in which such employee or any member of his family has a substantial interest and who transacts business with any state agency shall disclose such transaction. Such disclosure shall be submitted prior to January 31 of each year to the Secretary of State on forms provided by the Secretary of State. These forms are available from the MCG Division of Personnel and are mailed to all employees on or about the first of each calendar year. Employees who transact business with the State and fail to file the annual disclosure statement may be subject to civil penalties, including restitution, a fine of up to $10,000 and termination of employment. (See, Official Code of Georgia Annotated Section 45-10-26).

III. APPEALS

An employee who disagrees with a decision of a responsible representative or other MCG official with respect to a conflict of interest which directly involves that employee may appeal such decision as follows:

a. a decision of a department chair may be appealed to the dean;

b. a decision of a dean or vice president may be appealed to the President.

All appeals shall be in writing and shall be submitted to the official hearing the appeal within five (5) working days of the employee's notification of the decision. The decision of the President in all matters related to this policy shall be final as to the Medical College of Georgia, subject to the right to appeal to the Board of Regents in accordance with the policies of the Board of Regents (See, Section 201.08, "Policies of the Board of Regents of the University System of Georgia").

IV. PENALTIES

Any employee who violates this policy may be subject to disciplinary action up to and including dismissal. Additionally, Georgia law provides penalties for those individuals transacting business with the state in violation of state law (See Official Code of Georgia Annotated, Section 45-10-26). Such civil penalties or fines would be in addition to any disciplinary action taken by the Medical College of Georgia.

0004.frm

Approved: Francis J Tedesco
Francis J. Tedesco, M.D.
President

Date: October 7, 1995

UNIVERSITY SYSTEM EMPLOYEES CONSULTANT SERVICES AGREEMENT BETWEEN INSTITUTIONS

1. REQUESTING INSTITUTION ____________ PROVIDING INSTITUTION ____________

2. REQUESTING INSTITUTION'S NEED for and description of services to be performed (attach additional sheets if necessary)

3. REQUESTING INSTITUTION'S JUSTIFICATION for obtaining part-time services from another University System employee in lieu of obtaining such services from a person not presently employed by the University System (attach additional sheets if necessary)

4. EMPLOYEE'S CERTIFICATION:

Name ____________

Social Security # ____________

Employed By ____________

Employee's Signature ____________

Date ____________

Employee to perform services as (mark one):

____ Chaplain ____ Fireman ____ Dentist

____ Registered Nurse ____ Licensed Practical Nurse

____ Licensed Physician ____ Psychologist

____ Certified Oral or Manual Interpreter for Deaf Persons

____ Teacher or Instructor of an evening or night course or program

____ Professional holding a doctoral or masters degree from an accredited college or university

5. METHOD OF PAYMENT: Subject to performance of services and approval of an invoice, payment will be made via the institution's normal processing channels for consultant services.

Account Number ____________
Fee for service ____________
Estimated Reimbursable expense ____________
Total estimated cost ____________
Projected Dates of Service ____________ ____________

6. PROVIDING INSTITUTION'S CERTIFICATION OF AVAILABILITY OF EMPLOYEE:

I certify that the above person is available to perform the described services and that the performance of these services will not detract from nor have a detrimental effect on the performance of the person's employment at our institution.

Employee's Dean/Department Head ____________ ____________ Date

7. APPROVED BY:

____________ President, Providing Institution ____________ Date

____________ President, Requesting Institution ____________ Date

8. APPROVED BY:

____________ Chancellor, Board of Regents ____________

AGENDA AGENDA AGENDA
for
WORKING SESSION
of the
ELECTRONIC HOUSE CALL PROJECT STEERING COMMITTEE
October 30, 1995
Medical College of Georgia Library
8:00 am -- 2:00 pm

1. Purpose of the Working Session
   - Review results of initial Steering Committee meeting on October 19,1995
   - Break out into Subcommittees
   - Regroup to review results of Subcommittee efforts

2. Review of Results of Initial Steering Committee Meeting
   - Conflict on Interest Disclosures
   - Election of J.Toler as Committee Chair for one year
   - Appointment of A. Brown as Committee Executive Secretary
   - Review of Tasks Comprising the Project and
     - Link EAMC to the Fiber-Optic-Based GSAMS Network
     - Implement a Cable-Based "Proof-of-Concept" Telemedicine System for Delivering Medical Care to the Homes of Selected Patients in Augusta and Fort Gordon, GA and to Residents of a Skilled Nursing Home
     - Prepare a Video Presentation
     - Extend the Distribution of GSAMS by Adding PC-Based Video Teleconferencing and Still Image Systems
   - Adoption of the "Electronic House Call" Name for the Project
   - Definition of a Meeting Quorum
   - Policies Regarding Voting
   - Formation of Four Subcommittees
     - Operations/Administrative Subcommittee
       - Ms. Laura Adams
       - Ms. Ann Brown
       - Mr. Jack Horner
       - Mr. John Peifer
     - Clinical Subcommittee
       - Dr. Max Stachura
       - Dr. Dan Ward
       - Dr. Dan Rahn
       - Dr. Lou Guill
       - Dr. Tom Jackson
       - Mr. Jim Toler
       - LTC Loretta Schlachta
     - Technical Subcommittee
       - Dr. Max Stachura
       - Dr. Dan Ward
       - Mr. Mike Burrow
       - Dr. John Searle
       - MAJ Bill Teece

   - Evaluation Subcommittee
      - Dr. Kevin Grigsby
      - Dr. Betsey Blakeslee
      - Mr. Jim Toler
      - LTC Loretta Schlachta
- Statement of Responsibilities of Steering Committee and Subcommittees
- Assignment of Proposal Tasks to Subcommittees
   - Operations/Administrative Subcommittee
      - Task 1--Link EAMC to the Fiber-Optic-Based GSAMS Network
      - Task 3--Preparation of a Video Presentation
   - Technical Subcommittee
      - Task 2, Subtask 1--System Demonstration, joint with the Clinical Subcommittee
      - Task 2, Subtask 2--System Development, joint with the Clinical Subcommittee
      - Task 4--Extend the Distribution of GSAMS by Adding PC-Based Teleconferencing and Still Image Systems, joint with Clinical and Operations/Administrative Subcommittees
      - FDA Approvals for Home-Based Units
   - Evaluation Subcommittee
      - Task 2, Subtask 3--System Evaluation
      - Human Assurance Approvals
- Discussion of FDA Approval for Computer-Based Units to be Installed in Homes
- Decision to Invite Dr. Sanders to Join Steering Committee as an Ex Officio Member
- Decision to Film Previously-Reviewed Material for the Video Presentation

3. Breakout into Four Subcommittee Meetings
   - Appoint Chairperson
   - Review proposal tasks assigned to subcommittee
   - Develop a working plan for each task
4. Report of Subcommittees

Electronic House Call Project
Steering Committee Meeting
October 31, 1995
8:00 am

The Steering Committee of the Electronic House call Project met on Tuesday, October 31, 1995 at the Medical College of Georgia Library.

Members Present	**Institution**
Mrs. Laura Adams	Medical College of Georgia
Dr. Betsey Blakeslee	Eisenhower Army Medical Center
Mr. Mike Burrow	Georgia Institute of Technology
Dr. Kevin Grigsby	Medical College of Georgia
Mr. Jack Horner	Eisenhower Army Medical Center
Mr. John Peifer	Georgia Institute of Technology
Dr. Dan Rahn	Medical College of Georgia
Dr. Max Stachura	Medical College of Georgia
Mr. Jim Toler	Georgia Institute of Technology
Dr. Dan Ward	Eisenhower Army Medical Center

Other Attendees: Mrs. Ann Brown, Recorder, Mr. Vince Colwell, Dr. Tom Jackson, Dr. John Searle, MAJ Bill Teece

Mr. Jim Toler, Chairman, called the meeting to order. After establishing that a quorum was present, he noted that there is a new Conflict of Interest Policy which must be addressed. Mrs. Brown distributed a copy of the policy to the group and Dr. Grigsby explained its importance. He then asked the question, "Does any member of the committee have a conflict of interest constituted by board membership, stock ownership, family membership, or subcontract/ consultant arrangement with any companies related to the project?" No conflicts were disclosed.

Mr. Toler explained that the plan was to meet as a steering committee to explain the challenges ahead of the group, and then break into sub committees for meetings, and finally to meet back together to coordinate activities across subcommittees.

He reviewed the actions of the subcommittee from the last meeting which are summarized on the agenda. Dr. Jackson asked if there is a difference in FDA approval for nursing home and home use. Dr. Grigsby replied that he was not aware of any difference, but the product must meet four requirements to be seen as a medical device. It appears that telemedicine is not seen as a medical device right now. By FDA standards, it is seen as a means of communication. MAJ Teece asked if there is a difference in FDA approval for the actual device and a "proof of concept" demonstration. Dr. Grigsby answered that a demonstration of this type must be considered an "investigational new device" or IND. He further indicated that this project has been asked to use

off the shelf technology when possible, and will have to discuss with the FDA at every state of the project, in order to avoid conflicts.

Dr. Ward asked to add Mr. Vince Colwell from the Center for Total Access at Fort Gordon to the technical subcommittee . Mr. Toler responded that the subcommittees can add members as necessary, keeping in mind that increases in size will hinder communications.

Mr. Toler told the group that the sponsoring agency has not named a "Program Manager;" however, Dr. Betsey Blakeslee is a Fort Detrick liaison assigned to this project.

Dr. Rahn asked if we are required to provide reports to the sponsoring agency. Mrs. Brown responded that only quarterly financial forms are required.

Mr. Toler told the committee that it is four months into the one year project, with the potential for a 5 year project.

The subcommittees broke out at this point into two rooms to have meetings.

Clinical Subcommittee - Max Stachura, Chair
Dr. Stachura reported that there are two phases to the project. 1) Nursing home: Salem Nursing home will be used. Dr. Jackson cares for 70 patients there. From home, he will take phone calls as usual and will make a decision based on the telephone interview. Then he will decide if the connection is needed. He will record, store, and e-mail to some location where data will be stored, and he will go to the nursing home to re-see patients who have been seen via telemedicine to see if they need follow up. He will use the data gathered to make a hypothesis. No different equipment will be needed for the nursing home.

2) House call project: one system will be installed in 3 months. A test has been installed in John Searle's home which is connected to the MCG bioengineering lab. Debugging is occurring at this time. In the following 6 months, 25 patients will be seen with the equipment in their homes. In order to identify patients, they need to know what areas of the community are served by Jones Intercable. The goal is to wire 12 homes by January. The remainder will be Eisenhower homes. If they cannot fill the number, MCG will take more patients. November 15 will be the deadline for identifying patient names at MCG and to have a draft of clinical protocols for these patients. Dr. Stachura will take these protocols to human assurances in cooperation with Dr. Grigsby. The goal date for passing the committee will be December. The questions this committee needs answers to are: Do the patients identified have to have Jones Intercable already running to their homes? Are there ways to work with Crown Cable, Fort Gordon's cable carrier, in order to access Eisenhower hospital? Can patients be identified who live on the base? What is the geographic domain of Jones Cable?

Evaluation Subcommittee - Kevin Grigsby, Chair
Dr. Grigsby reported that there are 3 activities associated with research/evaluation. 1) orderly classification - questions about the system will be asked. Is it safe, valid, reliable? Does it prevent transportation out, in? 2) Formative evaluation - the process of projects evaluation by observation, and description of what happens. 3) Develop a set of hypotheses - eventually summative, but not the first year. Reliability of data, will be assessed. Opinions on the acceptability of this technology will be asked.

Dr. Blakeslee informed Dr. Grigsby that the Army has hired "vector research" company to coordinate research/evaluation efforts for the Army projects. She suggested that he coordinate with this firm. Dr. Stachura asked if there is a plan on incorporating with the home health care nurses. Dr. Grigsby replied that LTC Loretta Schlachta has submitted such a project. Mr. Peifer asked what system we are evaluating. Dr. Grigsby answered that this is important to understand - we are evaluating, not having "research" with control group and something to hold constant (other than prior history.) The action items are: 1) patient protocols to be developed, 2) identify what the system involves - what it will measure and ask the question, "Have any of the devices had previous FDA approval?" The IRB is the first level of approval. The technical and evaluation subcommittee (Dr. Grigsby and Mr. Burrow) will address FDA issues.

Operations/Administration Subcommittee - Laura Adams, Chair
Mrs. Adams reported that the two issues this committee addressed were 1) the videotape production, and 2) Eisenhower Army Medical Center as a telemedicine site. The videotape script is almost completed. This committee asked Dr. Stachura to review it and then the taping will begin in a few weeks. Copies of the completed tape will be provided to EAMC, Ft. Detrick, MCG, GIT, and a master copy. The producers at Georgia Tech need a piece of film or tape from the Army of a helicopter flying and landing. MAJ Teece will find this and forward to the producer at Georgia Tech.

Eisenhower as a telemedicine site: Mrs. Adams reported that she has a site visit scheduled for November 14 to select a telemedicine room at Eisenhower and to meet with appropriate parties.

Other: This committee wishes to assist other committees in operational issues such as: "How will training rooms be set up?" Original thoughts had been that one room would be configured as a patient's den and one would be used to train the patients. Is this still desirable? The database that Georgia Tech is developing for the Georgia Statewide Telemedicine System is in progress. Perhaps this database could be used for this project as well. The administrative/operations committee will provide information to the clinical committee on what information is being collected in the GSAMS database. Other questions include: "Why are the sessions going to be recorded or videotaped? Will this occur from the patient or physician side?" Mrs. Adams agreed to pass along questions of this type to the appropriate subcommittee chair, with a copy to all subcommittee chairs.

At this point, Dr. Blakeslee indicated that she had an issue to bring up before Dr. Stachura had to leave for clinic. She indicated that she has had preliminary conversations with a company about this project. They have been talking about having a portion of their service for home health care. This steering committee would be able to take advantage of their entertainment industry division. The outcome of this project would be able to carry medically based information to homes, and would be a marketable product. She indicated that this group needs to be in the business of connecting with marketable companies. She believes this company would be an excellent partner and would enable the involved institutions to further this project. She mentioned two things that would kill potential relationships: legal negotiations and not working fast enough. She believes that Georgia Tech people have the same market orientation for the project. She has also spoken with Dr. Tedesco about this and he is interested. For the Army, the negotiating power is good; they can implement the project at Eisenhower and can pull in MCG, Georgia Tech, and citizens of Augusta. Mr. Toler indicated that he has discussed this with the Office of Technology Transfer, and is trying to avoid potential problems.

Dr. Grigsby mentioned that the Conflict of Interest Policy must be considered. He indicated that MCG does not have a person on campus who is able to assist with arrangements of this nature. The Medical College might allow working through Georgia Tech's person since this is a joint project. Dr. Blakeslee indicated that she would like to have some steering committee members meet with corporate executives about this project. Mrs. Adams suggested that the steering committee take action on this recommendation. For this to occur, the steering committee would take the information under advisement and would take the Conflict of Interest information to the President of the Institution who would probably appoint a monitor to oversee this project to make sure it is not steered in the direction of the company's needs. Dr. Blakeslee indicated that it is much too early to begin talking about this issue to others because this is a company's marketing strategy. Dr. Stachura responded that the Steering Committee must be given the latitude to talk to the Dean and President about this. If the Steering Committee then decides to go in a different direction, that would be their decision. Dr. Stachura mentioned the Conflict of Interest issue, and that no person can have an individual interest which might skew the outcome or the direction of the project. He suggested that the question should be asked again. Dr. Blakeslee indicated that she is not a consultant to this company, she merely sees the urgency in marketing such a great project. Mr. Burrow suggested meeting with corporate representatives in the very near future to see if the steering committee is interested in working with them. He suggested inviting them to come here to meet with steering committee members. Dr. Blakeslee stated that they might not be willing to work with us at this phase. She will try to get them to come here. Dr. Grigsby indicated that a number of institutions are very good at negotiating this type of partnership. He mentioned that the committee might not want to have a formal meeting with them at this time. Mr. Toler mentioned that universities are going to try to get more in the corporate marketplace. Dr. Blakeslee will speak to corporate representatives regarding this and Mrs. Adams, Dr. Stachura, and Dr. Grigsby will discuss with the President and Dean of Medical College of Georgia.

Technical Subcommittee-Mike Burrow, Chair
This committee has investigated a commercially available system called imagelink, which supports Ethernet. There is no formal agreement on using this system. Jones Intercable acquired two Ethernet systems and put one into John Searle's home and one into the lab. They are continuing to work out the bugs in this system. This will be the "testbed" system. The action items for this subcommittee include: prioritizing the medical parameters from a technical standpoint. In order of ease or connection, they are 1) pulse oximetry, 2) ECG, 3) vitals, 4) stethoscope, 5) spirometry, 6) blood chemistry.

Dr. Blakeslee asked if the company she is in touch with could be shown the various commercially available products. Mr. Burrow responded that this could be arranged. Dr. Blakeslee indicated she would like to set this up for a visit at Eisenhower Army Medical Center. Color of patients (skin) has been discussed. Dr. Ward indicated that skin tone is important for various medical reasons. There may have to be a standard lighting or color around the patient to assist with obtaining the proper color. The other question is the patient population of Eisenhower that is not covered by Jones Intercable. Eisenhower itself is not covered. Crown Cable serves Fort Gordon as well as some parts of the area. Dr. Blakeslee indicated she would like to see some "on base" residents participating.

Mr. Horner asked about Silicon Graphics providing 15 computers. Mr. Toler responded that these computers represent a great deal more expense than the project is able to incur. His opinion is that the committee really doesn't intend to ask for these computers.

The meeting was adjourned at 2:00 pm.

Respectfully Submitted,

Ann H. Brown, MHSA
Recorder

Electronic House Call Project
Clinical and Technical Subcommittees Meeting
November 29, 1995
10:00 am

The Clinical and Technical Subcommittees of the Electronic House Call Project met on Wednesday, November 29, 1995 at Georgia Institute of Technology.

Members Present	**Institution**
Dr. Betsey Blakeslee	Eisenhower Army Medical Center
Mr. Mike Burrow	Georgia Institute of Technology
Mr. Vince Colwell	Fort Gordon
Mr. Jack Horner	Eisenhower Army Medical Center
Dr. Tom Jackson	Medical College of Georgia
Mr. John Peifer	Georgia Institute of Technology
LTC Loretta Schlachta	Eisenhower Army Medical Center
Dr. John Searle	Medical College of Georgia
Dr. Max Stachura	Medical College of Georgia
MAJ Bill Teece	Fort Gordon
Mr. Jim Toler	Georgia Institute of Technology
Dr. Dan Ward	Eisenhower Army Medical Center

Other Attendees: 2LT Tom Baker, Mrs. Ann Brown, Recorder, Mr. Ed Price, SPC Howard R. Rentschler, Mr. Andy Quay, Dr. Michael Sinclair, Mr. Barry Sudduth, Mr. Mike Winfrey

Mr. Jim Toler, Chairman, called the meeting to order and introduced the group. He explained the purpose of the meeting was for the clinical subcommittee to assist the technical subcommittee in finalizing a listing of needed equipment for the project. He reviewed the decisions made at the previous meeting on October 31. The commitment was made to install pc based equipment with Windows in 12 homes in January. Clinicians identified nine diagnostic parameters to measure. The technical committee was to continue to work with Jones Intercable. Some questions have arisen with Jones and their ability to meet the time period with working equipment. They have changed equipment and are on the right path with some new Zenith equipment. Today, he explained that the technical committee will present options to the clinical subcommittee and the information will first be discussed and then demonstrated in the laboratory.

Jones Intercable has provided a map of the area they intend for this project to cover. Dr. Jackson lives outside this area, which might cause a problem since one of the units is to be installed in his home. Dr. Searle will investigate possible solutions with Jones personnel.

The technical subcommittee distributed and reviewed handouts explaining each piece of equipment, use and approximate cost. Dr. Stachura raised the question of who will own the

equipment once it is installed in patients' homes and the replacement considerations of lost or damaged equipment. It was suggested that alarm devices could be installed along with the equipment which would alert the monitoring center if the equipment is unplugged. The plan is to order 15 units, which will provide for three "floating" units in cases of malfunction.

Dr. Blakeslee asked if there would be a provision to replace one of the measuring devices with one from a different manufacturer if a better one is recognized at some point during the project. The technical subcommittee agreed that this would be possible.

At this point Mr. Toler introduced Dr. John Limb of the Broadband Telecommunications Center and he discussed his study of delivering service to the home.

Dr. Blakeslee asked if any military homes will be among the 12 installed in January. Dr. Stachura explained that due to the Crown Cable/Jones problems the strategy adopted at the last meting was to install the first 12 homes with no military participants, but to modify this if the problems were worked out and military homes identified. Mr. Colwell reported that Fort Gordon runs its own cable and owns the hardware. Dr. Blakeslee suggested having some military homes participate in January, whether military beneficiaries in the Jones area or on post at Fort Gordon.

Mr. Peifer discussed the software issues and planned features. A member suggested that the software should be written at the 5th grade reading level to account for varied levels among patients. Mr. Quay indicated that the developers plan to have a voice reading the instructions and then once the patient learns to take the particular measurement, they may opt to turn off the instructions.

Dr. Blakeslee indicated that the Army is pursuing a separate agreement with the corporation TCI which will involve placing a personal computer in every home/barrack on base at Fort Gordon. This would provide a network on which to use the electronic housecall product once it is completed.

Mr. Toler asked about the status of this project after the contract period ends on June 30. Dr. Blakeslee replied that the wish is for Fort Gordon to be the communications hub for the Army. In the Spring, there is an initiative to present two congressional leaders with this project. This is very important to the future funding. She said that she recognizes the need of participating institutions to know about future funding as soon as possible.

The group moved to the laboratory to observe demonstrations of each interface and piece of equipment. Following the demonstrations, lunch was served.

The majority of the group preferred the image provided by ImageLink versus that provided by Intel, but the cost is almost double Intel's. The demonstrators indicated that a card used along

with Intel would make the still image as good as that provided by ImageLink, for an approximate cost of $1500. This option (Intel plus a card) would be considerably less expensive than the ImageLink system. The group recommended that the Intel system plus a $1500 card should be used and suggested that the purchasers communicate that they should incorporate the card. The suggestion was also made that the one-chip Canon camera be used along with the system. It is the only camera of that type that provides a zoom capability. The motion was made, seconded, and adopted that the Intel system, extra card, and Canon camera be used to provide a comparable still image to the ImageLink system.

Discussion of the diagnostic equipment ensued. LTC Schlachta indicated her preference for the Critikon system by Johnson and Johnson which provides five measurements (see attached equipment information) due to the ease of the EKG portion and concern that separate pieces of equipment will be lost or damaged in the patients' homes. Mr. Toler mentioned that all pieces would be enclosed in a cabinet with just the piece of equipment to use accessible to the patient. This would prevent loss of equipment. Mr. Peifer stated that a keyboard and mouse will come with each system but will probably not be accessible to the patient.

The disadvantage to the Critikon/Dynamap system is that all patients will not need all these measurements taken and that new devices will not be able to be added as they become available. With individual components, newly available pieces could be added. The point was made that this is only a test and that as other equipment becomes available, the decision might be changed.

Dr. Blakeslee indicated her preference for component pieces as opposed to the Critikon system in order to have the best available measurements of each type. The idea for the initial 12 units to be composed of one type of measurement device and other subsequent units to be composed of another was discussed. Since computers only have two ports for input devices, additional ports would have to be installed into each computer if more than two devices are used. This would make it easy to use the Critikon unit plus one other device. The user instruction and communication interface will be developed to go along with whichever devices are used; thus changes for subsequent units will require redevelopment of the software interfaces.

Dr. Blakeslee reiterated her strong desire to have some military patients and physicians involved with the initial 12 homes.

Dr. Stachura stated that he would like to obtain input from Cardiologists and Pulmonologists in selecting a stethoscope. An evaluation will be held in Augusta, possibly next week. The motion was made to compose the unit of the Critikon integrated system plus a stethoscope (to be selected) with the understanding that the ultimate goal is to use individual components.
For patients' weight, a standard digital scale will be used. The technical subcommittee will decide on the cabinet design.

The patients will not have to have a "keeper" or other person to assist in using the equipment. The technical subcommittee now needs the protocols for how the physicians will be using the devices selected. Dr. Stachura indicated that clinicians from Eisenhower and MCG will meet next week.

The question arose about monitoring stations. Will there be one or two monitoring stations? Will they be monitored by MCG or Eisenhower? MAJ Teece stated that is may be impossible to have Eisenhower physicians and patients who live within the area. The questions arose: Can Eisenhower physicians monitor their patients from Eisenhower? Can they monitor from MCG? Can they monitor from their homes (within the Jones area)?

Members discussed the connection possibilities and brought up the Ethernet connection and the possibility of using the GSAMS network (which will include Eisenhower and MCG). Dr. Stachura explained that the GSAMS network is administered by the Telemedicine Center at MCG but is a private network owned by the state. The uses of this network are exclusively medical and conferencing. No one at MCG has the authority to make decisions about its uses. The MCG people participating in this project are in essence wearing two hats - one to work with this project to develop the electronic house call prototype, and one to implement and maintain the GSAMS system, but the two tasks are separate.

The committee discussed possible patient interfaces and decided upon using a touch screen.

Dr. Searle and John Peifer will contact Jones Intercable to demonstrate their communication link and to put the Intel information on it. The collective opinion of the group was that Jones Intercable should be given a deadline of December 22 to have a working connection to John Searle's home, Tom Jackson's home, and MCG. This will be recommended to the Steering Committee to act upon. A back-up plan in case Jones Intercable cannot meet the deadline is to use the ISDN.

The subcommittee meeting was adjourned at 3:00 pm.

Respectfully Submitted,

Ann H. Brown, MHSA
Recorder

BOM.XLS

			Electronic House Calls System	
			Bill Of Materials	
			Proposed System	Options
Item/Vendor				
1) Computer Platform			$3,275.00	
	120MHz Pentium			
2) Video Conferencing System			$2,550.00	
	Intel ProShare			
3) Johnson & Johnson			$6,300.00	
	Critikon			
4) Electronic Stethoscope			$0.00	
5) RF Modem			$500.00	
	Zenith Home Works			
6) Camera			$1,500.00	
	Canon VC-C1			
7) Software			$200.00	
8) System Cabinet			$250.00	
9) Touch Screen Added Cost			$800.00	
10) Still Image Enhancement Card			$1,500.00	
		Unit Price	$16,875.00	
		Quantity	15	
		Total Price	$253,125.00	

Electronic House Call Project
Meeting
January 8, 1996
12:00 noon

The Eisenhower Representatives on the Electronic House Call Project met with Dr. Max Stachura on Monday, January 8, 1996 at Medical College of Georgia's Telemedicine Center.

Members Present	**Institution**
Mr. Jack Horner	Eisenhower Army Medical Center
LTC Loretta Schlachta	Eisenhower Army Medical Center
Dr. Max Stachura	Medical College of Georgia
Dr. Dan Ward	Eisenhower Army Medical Center

Other Attendees: Mrs. Ann Brown, Recorder

LTC Schlachta announced that General Xenakis has appointed her to be a full time project manager and his representative for Eisenhower Army Medical Center's involvement in the Electronic Housecall Project. Dr. Dan Ward' role is to assist in running Eisenhower's Telemedicine System, and he will continue to participate in parts of this project as well.

Human Assurances were discussed. Dr. Stachura has completed MCG requirements, including general patient protocols, and hopes to have clearance by next month in order to install in homes.

Eisenhower Army Medical Center can identify patients in whatever geographical "grid" is established for the project. They have submitted their application and are hoping to receive expedited review next week. Once IRB approval has been documented, patients may be approached.

Dr. Stachura said his understanding of the current cabling situation is that Jones Intercable may change the geographic "grid" earlier distributed; the nursing home will be included, but Fort Gordon will not.

The next issue concerns the central station monitor nurse who has protocols to follow and will coordinate with each specialist. Dr. Stachura mentioned that there will be two exceptions for MCG physicians. The PA who works with the Diabetes patients will participate in the "housecalls" for those patients, and the pediatric nurse clinician will work with children using the housecall system.

The issue of the 1.5 nurses to hire to operate the central station is an operational issue as well. Max explained that since the funds come through the Army, and Eisenhower is supported by the Army, funds cannot be given to Eisenhower to do any parts of the project. Mr. Horner indicated

that they were not expecting any funds, but that the nurse hired at MCG could also monitor the Eisenhower patients, since the terminal will be at MCG, and since the funds should support the "project," which includes Eisenhower.

There was discussion about what would actually be at Eisenhower. LTC Schlachta envisions a "sub-base station" connected from MCG to EAMC by ISDN lines. If Eisenhower's patients need the advice of their physicians, the "telenurse" can then page the physician at EAMC and modem information to the sub-base station there.

Dr. Stachura explained his understanding that the 1 .5 FTE is for the MCG patients and that Eisenhower will need to provide a nurse to man the monitors for its patients. Clearly, there is a difference of opinion on the 1.5 nurse's use. MCG sees it as supporting MCG patients exclusively, while Eisenhower's view is that it will support the "project," to include Eisenhower's patients.

Discussion ensued about the initial contact of these patients and who would provide them the details of the project. LTC Schlachta reported that her idea was that the primary care physician would initiate contact about the housecall project, and if the patients seemed interested, the monitor nurse would contact the patients and arrange possibly a home visit to get to know the patients better and would be the person responsible for obtaining the consent forms, etc. Dr. Stachura explained that it was the clinical subcommittee's decision on the detail of the monitor nurse's involvement.

Eisenhower's representatives expressed concern at the slow movement of the project and suggested having a weekly meeting. Dr. Stachura and Mrs. Brown explained that this was designated as a committee-run project due to three separate institutions' involvement and the need to have agreement before going ahead on various aspects of the project.

Dr. Stachura reiterated that little could be done with patients before the human assurances approvals have passed the committees. He summarized that the operations subcommittee needs to meet to settle the issues of nurse monitor duties. A portion of the clinical subcommittee (Max, Loretta, Jim Toler) needs to meet to discuss recommendations of the entire clinical subcommittee.

Mr. Horner asked if there was a document with time lines and deliverables. Mrs. Brown responded that she had a copy of the cooperative agreement, which has a few deadlines on it. He suggested that the 18 page document be shared with the entire steering committee.

The meeting was adjourned at 1:00 pm.

Respectfully Submitted,

Ann H. Brown, MHSA
Recorder

1. Specific Aims

The primary purpose of this study is to provide a demonstration of concept or feasibility study for the integration of commercial-off-the-shelf (COTS) computer soft ware, hardware, cameras, communications and approved medical sensors into a clinical telemedicine system which can become a useful tool assisting the management of individuals who are mostly home-bound with chronic illness. The two way system is designed to allow the home health nurse or physician to visit the patient virtually and obtain the assessment and information which might be available from a personal visit. The patient may continue to avail themselves of their regular medical care or any alternative they choose. Only a small number of patients, approximately twelve from MCG and twelve from EAMC, will be enrolled. They must reside within a cable service area and have chronic illness for which they may receive frequent medical attention.

Data gathered will be on the usability of the system and will not be comparative. Small sample size will preclude statistical analysis though patient attitudes, resource utilization, equipment usability will be noted. Patient data will be recorded to determine reliability and usefulness of collection. It is intended that the equipment will be upgraded during the study as rapidly as possible to derive the best and most economical model for future applications.

2. Theoretical Framework

3. Background and Significance

Improvement and extension of home health care are necessary if continued quality medical care is to be offered an ageing population at an affordable price both socially and economically. Utilizing applications of telecommunications and informatics in this role, determining what they can do and what needs to be done along with the development of equipment and software to accomplish these goals is a necessary part of reshaping our health care delivery system. The military does not use visiting nurses for home health care to provide care for chronic illness nor does it have a hospice program for those terminally ill. Both programs have proven benificial in civilian health care and are increasingly looked upon as quality enhancers with cost containment.

Improvements in performance of electronic products and transmission coupled with rapidly decreasing costs make the search for electronic solutions to problems of health care provision much more attractive.

Technical improvements of equipment and transmission continue to progress at very rapid rate, so much so, that one must basically make a decision to freeze a design process and go with proven or accepted products, knowing that products are being introduced which will make products obsolete from the beginning. This requires rapid iteration during development as well as immersion of the design team into the rapicly emerging and expanding field. All of the equipment used in these trials have been FDA approved.

4. Preliminary Studies

A larger comparative study was previously approved by the EAMC IRB last year for a study by LTC. Schlacta. Her study, unfortunately, was not funded but was much more complex than this study proposal. This study is in many ways similar but not as large and is not comparative. It is more of a field test of equipment than a clinical study. A number developmental projects for similar types of equipment are underway throughout the United States. We have seen numerous demonstrations of equipment from vendors but chose to develop our to get more exactly what was wanted as well as developmental experience with this type of equipment.

5. Research design and Methods

EAMC and MCG patients will not be mixed. Patients from each institution will be treated within the system of, by the personnel of, and within the customs of that institution. The commonality will be that they are using the same type of equipment and the same Telemedicine nurse will be seeing the separate patients enrolled from each institution. EAMC patients will be enrolled with the concurrence of their primary care physician, who will continue to be the primary physician and see the patients at their regular scheduled appointments. One or more physician specialist will be medical monitors for the study. The patient will have an individual nursing care plan which will be agreed upon by himself, the nurse, and his primary physician. The physician monitor will look at each plan and consult with the primary care physician as a "second opinion" reviewer to confirm that the patient and the plan meet the goals of the study with safety for the patient.

The Telemedicine nurse will see and treat the patient by telemedicine according to the plan at the times agreed upon and at others requested by the patient. Vital signs will be obtained and other necessary measurements such as PEFR and O2Sat will be obtained and displayed. The nurse will enter all measurements, along with a summary of the telemedicine visit with her observations and patient's reports into the data form which will be developed. The primary physician will be notified of any unusual findings or patient complaints and will be able to see the patient through telemedicine or arrange to see the patient in some other manner, just as they would through the telephone. The only difference between the present system and the Telemedicine system of seeing patients is that the patient will be seen with some regularity, have more frequent nursing assessment with alterations in details of care by agreed upon pre-planning. Compliance and adherence to treating regimen can be assessed and reinforced. Assessment of home environment will occur, caregiver instructions can be given and reinforced, and an interpersonal relationship established between the nurse and the patient and his caregivers.

The only problem might be that excessive reliance on the telemedicine system could make the patient or physician delay in taking actions in the course of the illness that might be otherwise taken. This will be guarded against by monitoring and by writing care plans which will stress conservative and cautious practices.

AGENDA AGENDA AGENDA

STEERING COMMITTEE MEETING
(VIA VIDEO TELECONFERENCE)

for the

ELECTRONIC HOUSE CALL PROJECT

2:30 - 4:30 pm
January 18, 1996

WELCOME AND INTRODUCTORY REMARKS

1. **CONFIRMATION OF A QUORUM**

2. **REQUEST FOR AN ADDITION TO THE COMMITTEE'S MEMBERSHIP**

   EAMC has requested that Loretta Schlachta to be accepted as the fourth Army member on the Steering committee--see attached correspondence.

3. **BRIEF REVIEW OF STATUS OF SUBCOMMITTEE ACTIVITIES**

Technical Subcommittee	Mr. M. Burrow
Clinical Subcommittee	Dr. M. Stachura
Operations Subcommittee	Ms. L. Adams
Evaluation Subcommittee	Dr. K. Grigsby

4. **UPDATE ON CATV COVERAGE AREA**

5. **RESOLUTION OF ISSUES RELATED TO EAMC CENTRAL MONITORING STATION**

   Linkage between Central Monitoring Stations
   Staffing of Central Monitoring Stations

6. **PREPARATION OF A MASTER MILESTONE CHART**

   Obtain charts from each Subcommittee
   Integrate Subcommittee charts into a Master Milestone Chart
   Distribute Master Chart to Steering Committee Members

Electronic House Call Project
Steering Committee Video Conference Meeting
January 18, 1996
2:30 pm

The Steering Committee of the Electronic House Call Project met on Thursday, January 18, 1996 by video conference between Georgia Institute of Technology and Medical College of Georgia.

Members Present	**Institution**
Mrs. Laura Adams	Medical College of Georgia
Mr. Mike Burrow	Georgia Institute of Technology
Dr. Kevin Grigsby	Medical College of Georgia
Dr. Dan Rahn	Medical College of Georgia
Dr. Max Stachura	Medical College of Georgia
Mr. Jim Toler	Georgia Institute of Technology

Members Absent	**Institution**
Dr. Betsey Blakeslee	Eisenhower Army Medical Center
Mr. John Peifer	Georgia Institute of Technology
Dr. Dan Ward	Eisenhower Army Medical Center
Mr. Jack Horner	Eisenhower Army Medical Center

Other Attendees: Mrs. Ann Brown, Recorder, Mr. Vince Colwell, (EAMC), LTC Loretta Schlachta, (EAMC), Dr. John Searle, (MCG).

Welcome
Mr. Jim Toler, Chairman, called the meeting to order and introduced the group. He reviewed the agenda and asked for any changes. There were none.

Confirmation of Quorum
Mr. Toler asked Mrs. Brown to confirm that a quorum of members was present. She confirmed that with Mr. Colwell and LTC Schlachta representing EAMC, each institution was adequately represented.

Request for Addition to Committee's Membership
The first item of business was to consider a letter from Mr. Jack Horner that LTC Loretta Schlachta become a member of the steering committee to represent Eisenhower Army Medical Center. Mrs. Adams raised the point that the letter mentions only two current members representing EAMC (Dr. Blakeslee and Mr. Horner), while Dr. Dan Ward is also an EAMC representative on the committee. A motion was made and seconded that LTC Schlachta become a member of the steering committee. It was unanimously approved. In response to Mrs. Adams' comment, EAMC will make a decision on their representatives and report at the next steering committee meeting.

Review of Subcommittee Activities
Technical Subcommittee - Mr. Mike Burrow reported that the hardware for 15 systems has been ordered and almost all has arrived. Two outstanding items are the electronic stethoscope and the video card for the computers. A demonstration patient and central monitoring system are being built (using borrowed video cards). They will demonstrate two homes with units linked to a central monitoring unit. The connection will be by LAN (local area network) rather than cable. They will be completed (except for the stethoscopes) on Friday, January 19. Video clips explaining how to use the devices will be filmed Monday, January 22 to be included as part of the system. The Technical Subcommittee needs the Clinical Subcommittee to provide scripts on how use the devices, and, if possible, a clinical person to attend the filming. Dr. Stachura volunteered to attend the filming on Monday.

Clinical Subcommittee - Dr. Stachura reported that protocols of MCG patients have been written and submitted for review by the MCG Institutional Review Board on Monday, January 22. Mr. Toler announced that Georgia Tech's IRB will accept MCG's submission. Eisenhower also expects review by their board Monday; however, their application will also be reviewed in Washington before approvals are granted. A pool of patients will be contacted once the IRB has granted approval. Dr. Stachura indicated that this committee has been discussing the difference of understanding in how many clinical sites there are to be and the staffing of each. MCG envisioned a specialist physician consulting with specialty patients, while EAMC believed the primary care generalists would be providing the care for their patients. LTC Schlachta said another discrepancy has been the question if there are two staffed monitoring stations, each with its own patients, or one monitoring station to handle patients of both MCG and EAMC.

Operations Subcommittee - Mrs. Adams reported that the EAMC site visit to select a telemedicine room was postponed and an alternate date has not been confirmed by Mr. Horner. Mr. Toler asked if LTC Schlachta or Mr. Colwell could organize this visit due to Mr. Horner's travel schedule. They agreed. Mrs. Adams explained the site visit and who would need to participate. She also announced that this committee has been discussing the budget redirections to work out personnel to staff the project.

Evaluation Subcommittee - Dr. Grigsby reported that he has put in a substantial amount of time preparing the human assurances forms. Once the approvals have been granted, the committee will begin planning for evaluations. Dr. Rashid Bashshur from University of Michigan was included in the cooperative agreement as an evaluator and is involved in the process already.

Mr. Toler announced that the video tape has been produced. He reviewed it last week and suggested some improvements in the audio. Following these adjustments, he will provide a copy to Commander Greenauer, Director of Informatics Integration at the Medical Advanced Technology Management Office (MATMO). LTC Schlachta mentioned that this is an important sign of progress for the project and encouraged him to provide one as soon as possible. Dr.

Stachura stated that Commander Greenauer mentioned concern about current and future funding and that a decision will be made soon about this issue. He believes any deliverables that can be provided will increase the chances for continuing the project. Mrs. Adams added that the decision will be made by the end of February regarding future funding. LTC Schlachta indicated that the Commander would like a demonstration of some type to be made at a National Forum in April. Dr. Stachura stated that the Commander mentioned this to him but did not indicate that this project's budget would fund such a display. Mr. Toler requested that MCG find out if the MATMO officials would approve the expenditure of money from the current budget to fund travel and display costs for the forum in Washington.

Update of CATV Coverage Area
Mr. Toler indicated that he had spoken with George Paschal of Jones Intercable and they have outfitted some hubstation sites. This might change the geographic area of "hub zero" (the geographic area from which patients will be selected) which was distributed at an earlier meeting. Dr. Searle stated they had discussed the possibility of having a hub other than hub zero, but no definite area has been reported. The cable will run to Dr. Jackson's home and to the nursing home, which are both outside hub zero.

Dr. Stachura indicated that during his visit this week, Commander Greenauer asked that the group focus the action plan. His comments were: 1) It is most desirable to get cable to Eisenhower within 30 days. 2) MCG should pursue Jones' willingness to do this. 3) EAMC should pursue the necessary approvals to allow the connection of Jones onto the fort. The plan should be ready to implement; however, the fall back plan is to care for the military patients at MCG - this will involve legal issues with patient care and malpractice insurance, etc. Another plan is for MCG to provide a larger amount of patients or all initial patients until the other problems are worked out (how to get a cable connection from hub zero to EAMC.)

Mr. Toler asked the question, "Are we able to find the required number of patients within the limited geographic area?" LTC Schlachta responded that the military would be able to, and Dr. Stachura indicated that MCG would be able to find enough adult patients but might have difficulty identifying enough pediatric patients. Mr. Toler asked if this will be feasible the second time around with more patients, and everyone agreed that the patients would not be a problem. LTC Schlachta indicated that the issue of solving the access to EAMC is the largest problem right now.

The issues are: Vince Colwell spoke with Ron Johnson of Charter Communications, who disagreed with the plan and refused to cooperate. Three things need to happen: 1) In order to make the plan work, Jones must obtain franchise rights from Charter, which might have an associated cost. 2) Approximately 8 miles of cable will have to be buried or hung from Ft. Gordon to hub zero. 3) Once they get on to Ft. Gordon, the Director of Information Management for Fort Gordon has agreed to assist with access to the hospital.

Mr. Toler asked if someone would look into the following: 1) negotiating costs of additional cable with Jones, 2) leasing a line (confirm availability where needed), 3) a possible ISDN solution connecting MCG and Eisenhower via modems.

Mr. Colwell volunteered to provide the figures on leasing a line by Friday, Jan. 19.

Mrs. Adams expressed concern that the requests for Jones to access Fort Gordon have not been addressed to personnel at a higher level than the area manager of Charter Communications. Dr. Stachura mentioned that since this project has nothing to do with commercial enterprise of cable television, franchise rights should not be an issue. Dr. Stachura asked if the Commander of Fort Gordon could assist in allowing the Jones connection in order for this project to succeed. This seems to be the way to move ahead. The Eisenhower representatives will try to obtain assistance from the Commanders of EAMC and Fort Gordon to provide the needed approvals with the goal of connecting Jones Intercable to EAMC within 30 days.

The meeting was cut off at 4:00 pm when the scheduled connection was dropped.

Respectfully submitted,

Ann H. Brown, MHSA
Recorder

DEPARTMENT OF THE ARMY
CENTER FOR TOTAL ACCESS
FORT GORDON, GEORGIA 30905-5650

January 16, 1996

Center for Total Access
DDEAMC

Mr. Jim Toler
Co-Director and Principal Research Engineer
Georgia Institute of Technology
Bioengineering Center
Atlanta, GA 30332-0200

Dear Jim

As you are aware from our several recent conversations, Loretta Schlachta has been tasked with full time EHC project support from the DDEAMC perspective. In view of this I respectfully request that she be added to the Project Steering Committee. Not only is this appropriate due to her increased involvement, but it serves to more equitably staff the committee. Eisenhower at present has only two members, Betsey and myself.

I regret that I am unable to attend the meeting scheduled for January 18 due to business travel. I hope that this request can be addressed at that meeting. At the very least Loretta carries my proxy and represents me.

I look forward to seeing you soon and want to thank you for this consideration.

Sincerely,

Jack A. Horner
Director
Center for Total Access

ELCTRONIC HOUSE CALLS PROJECT

Technical Subcommittee

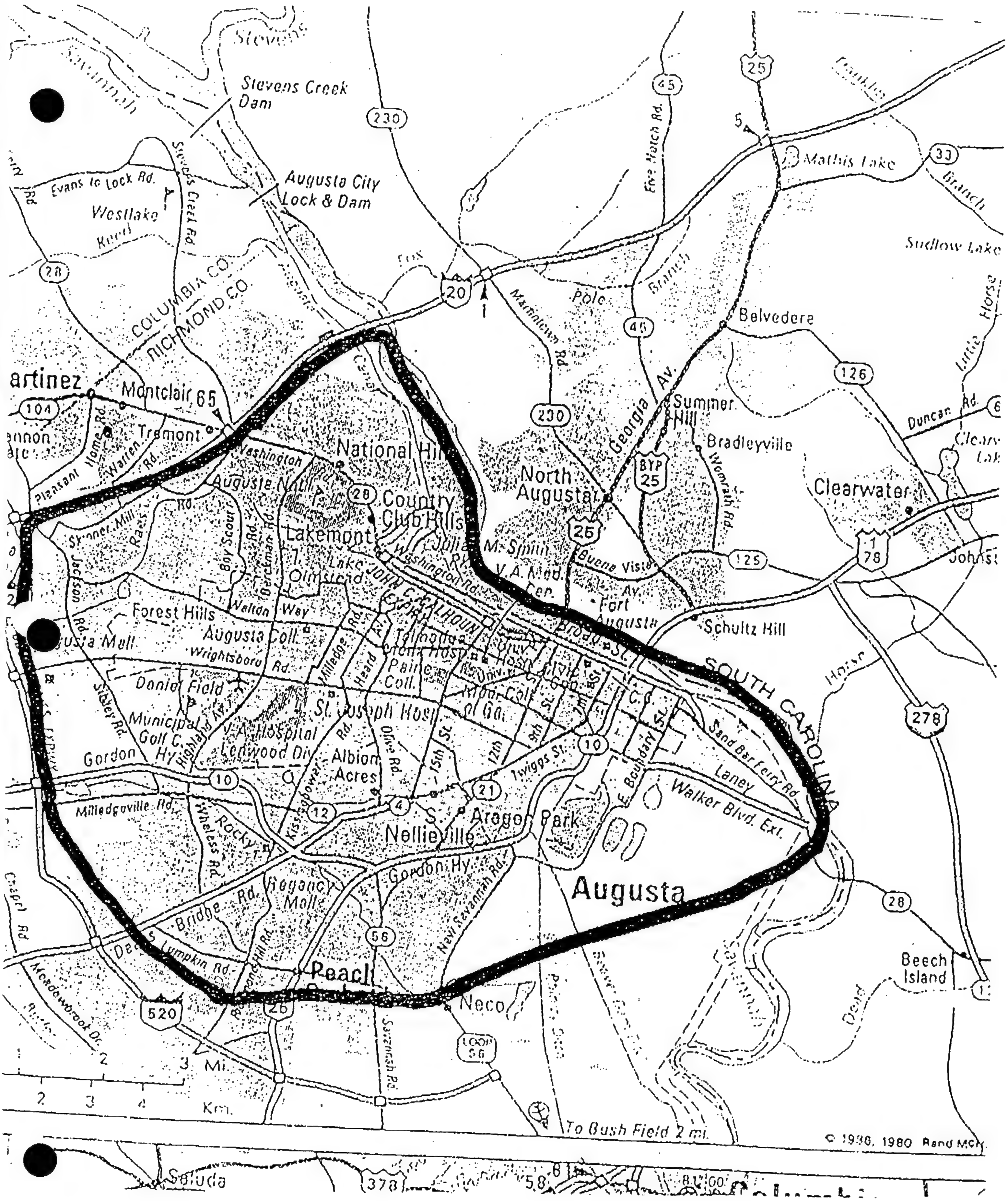
 1/12/1996

Technical Tasks	1996 Jan	Feb	Mar	Apr	May	Jun
Alpha Version Software Development And Testing	1/1 – 1/26					
Cabinet And Miscellaneous Cables, Power Strips, Etc. Identification And Purcahse	1/19					
Purchase Systems For Homes Of 13 Additional Patients, Nursing Home, And Eisenhower	1/19		3/8			
Assemble 15 Systems - 12 Home Units, 1 Central Monitoring Station, 2 Development Units	1/19 1/26					
Cable Equipment Installation For Patients Identified By The Clinical Subcommittee	1/22	2/2				
Test And Finalize A Solution For Linking With Eisenhower And Dr. Jackson's Home	1/22	2/23				
Cable Installation For Central Monitoring Station At MCG	1/22					
Installation Of A System In Dr. Searle's Home And At The Central Monitoring Station	1/29					
Beta Version Software Development And Testing	1/29		3/8			
System Debug With Alpha Software	1/29	2/5				
System Installation And Training In 12 Patient Homes		2/5 2/16				
Install Communications Links With Eisenhower And Dr. Jackson's Home		2/26	3/15			
Assemble 15 Additional Systems - 1 Central Monitoring Station, 13 Patient Homes, 1 Nursing Home, 1 Dr. Jackson's Home			3/11 3/20			
Install System With New Software Between Dr. Searle's Home And Lab At MCG			3/18			

ELCTRONIC HOUSE CALLS PROJECT
Technical Subcommittee

1/12/1996

Technical Tasks	1996					
	Jan	Feb	Mar	Apr	May	Jun
System Debug With Beta Software			3/19	4/5		
System Installation And Training In Nursing Home, 13 Patient Homes, and Eisenhower				4/8 4/19		
Investigate Component Based Approach For Monitoring Diagnostic Parameters				4/22		6/7
Final Report						6/3 6/28



Jones Intercable
"Hub zero"

Area in which they intend to access via cable T.V.

AGENDA AGENDA AGENDA

for the

ELECTRONIC HOUSE CALL PROJECT

STEERING COMMITTEE MEETING

February 1, 1996
8:30 am-11:00 am
Telemedicine Center
Medical College of Georgia

CALL TO ORDER AND WELCOME

1. **CONFIRMATION OF A MEETING QUORUM**

2. **ANNOUNCEMENTS**

   Tele-Home Care Conference, Denver, CO, March 14-15, 1996
   ATA Annual Telemedicine Conference, Albuquerque, NM, February 23-24, 1996
   EHC Video Tape Completed
   Status of home-based telemedicine unit development
   Status of system installation in Dr. Searle's home/lab
   Recent appointments to Project leadership positions
   Dr. Max Stachura, Project Director
   Ms. Loretta Schlachta, Principal EAMC Contact

3. **DISCUSS PLANS FOR PARTICIPATION IN THE NATIONAL FORUM: GLOBAL TELEMEDICINE AND ITS INTERNATIONAL IMPLICATIONS, APRIL 2-4, 1996, TYSONS CORNER, VA**

4. **REPORT ON STATUS OF ISSUES RELATED TO CABLE CONNECTIVITY TO EAMC**

5. **NEED FOR MILESTONE CHART FROM EACH SUBCOMMITTEE TO FACILITATE PREPARATION OF MASTER MILESTONE CHART**

6. **DISCUSS RESULTS OF PROJECT REVIEW MEETINGS WITH CMDR. GREENAUER**

7. **FINALIZE ISSUES RELATED TO NUMBER, LOCATION, STAFFING, ETC. OF CENTRAL MONITORING STATION(S)**

Electronic House Call Project
Steering Committee Meeting
February 1, 1996
8:30 am

The Steering Committee of the Electronic House Call Project met on Thursday, February 1, 1996, at the Medical College of Georgia Telemedicine Center.

Members Present	**Institution**
Mrs. Laura Adams	Medical College of Georgia
Mr. Mike Burrow	Georgia Institute of Technology
Dr. Kevin Grigsby	Medical College of Georgia
Mr. Jack Horner	Eisenhower Army Medical Center
Mr. John Peifer	Georgia Institute of Technology
Dr. Dan Rahn	Medical College of Georgia
Dr. Jay Sanders (Ex-officio)	Medical College of Georgia
LTC Loretta Schlachta	Eisenhower Army Medical Center
Dr. Max Stachura	Medical College of Georgia
Mr. Jim Toler	Georgia Institute of Technology
Dr. Dan Ward	Eisenhower Army Medical Center

Members Absent	**Institution**
Dr. Betsey Blakeslee	Eisenhower Army Medical Center

Other Attendees: Mrs. Ann Brown, Recorder, Mr. Vince Colwell, (EAMC), Dr. John Searle, (MCG).

Welcome
Mr. Jim Toler, Chairman, called the meeting to order and introduced the group. He reviewed the agenda and asked for any changes. There were none.

Confirmation of Quorum
Mr. Toler asked Mrs. Brown to confirm that a quorum of members was present. She confirmed that the requirement of two members representing each institution was met. She also asked if EAMC wished to make any changes in their representatives with the addition of LTC Schlachta to the Committee at the last meeting. Their representatives will continue to be Dr. Blakeslee, Mr. Horner, LTC Schlachta, and Dr. Ward.

Announcements
Conferences
Mr. Toler distributed information on several upcoming telemedicine-related conferences.
EHC Video Complete
Mr. Toler announced that the EHC video produced at Georgia Tech is complete. Mrs. Adams asked if each institution could have an original copy from which to make copies. He will provide

these. Copies of the video were provided to MCG and EAMC.

Status of home-based telemedicine unit development/Status of system installation in home/lab

Mr. Burrow provided these reports. He showed a photograph of the initial prototype unit, which is installed in a cabinet. The initial plan was to install a monitoring system in John Searle's lab yesterday and a home unit in his home; however, technical difficulties before leaving Georgia Tech postponed this until today following the meeting. Mr. Peifer reported on the software progress and showed photographs of some of the screens and a captured image. Selector buttons are used to move from place to place, and step-by-step video instructions for using each piece of diagnostic equipment are included. The user does not have to be literate to use the system. The equipment can be used without being connected to the monitoring site. Dr. Rahn asked if the line at the monitoring station could be connected to the physicians' pager number at times when the station is not monitored. Mr. Peifer indicated that this would require additional software. LTC Schlachta suggested a sign in front of the camera with the paging operator's phone number. Mr. Burrow explained that they are implementing far end camera control from the monitoring station for remote panning, zooming, etc. The camera will be mounted at a level corresponding to the center of the monitor and on a cube in order for the patient to appear to be looking into the camera when also looking at the monitor. A discussion ensued about how far away patients would be able to stand for a full-view shot. The decision was that for this test, a full view shot will not be needed based on the types of patients included. Dr. Sanders asked for a review of the measurements included. The patients' blood pressure, EKG, weight, pulse oximetry, temperature, and heart/lung sounds will be monitored. Blood chemistry, doppler, and spirometry, while initially discussed, will possibly be included in later models.

Recent appointments to leadership positions

Mr. Toler announced that Dr. Max Stachura has been named Principal Investigator while LTC Schlachta has been added to the Steering Committee as an additional Eisenhower Army Medical Center representative.

Discuss Plans for Participation in the National Forum: Global Telemedicine and its International Implications, April 2-4, 1996, Tysons Corner, Va

Mr. Toler indicated that Commander Greenauer is very interested in this project being represented at this meeting, and Georgia Tech is planning to go to show at the least the video tape, and hopefully a demonstrate a unit. Dr. Stachura added that Commander Greenauer would prefer a functioning unit to be demonstrated. He did not promise to provide travel funds but we should prepare a budget of costs to attend. Mr. Toler indicated that Georgia Tech will cover their travel with funds in their budget which were to fund an earlier trip to Washington that was canceled. Members concluded that a demonstration would be best. For the forum, each institution will send as many people as possible. Mr. Horner indicated that if the military qualifies for a discounted rate, he will procure the display space on behalf of the project.

Discuss Results of Project Review Meetings with CMDR Greenauer

Dr. Stachura updated the group. He mentioned that the Commander expressed disappointment in

the progress and offered assistance in overcoming barriers to progress. He made clear the potential benefits of coming "on line" within the time frame specified and asked for monthly progress reports from Dr. Stachura. The first report, due Feb. 29, will be used in budget discussions regarding future funding for this project. Funding decisions will be made in March. This document will include information from each Sub-committee and will need to show what has been done so far, what will be accomplished by June 30, and what could be accomplished by continuing with the project after June 30. LTC Schlachta said that Commander Greenauer mentioned to her that another proposal would be required to be considered for funding after June 30. Mrs. Adams asked Dr. Stachura to clarify what would be required to be considered for such funding - the February status report, or a full proposal. He agreed to do so.

Cable Connectivity to EAMC
Mr. Colwell reported that he provided a letter to Mr. Burrow explaining the three options. They are described in the chart below:

Option	Cost	Time to Implement	Remarks
Jones Intercable providing a connection	$200-$300 monthly	Up to 6 weeks - 2 weeks in-house processing, 4 weeks schedule/install	Go/No Go decision by Jones is due possibly by 31 January
ISDN @ 384 Kbs from BellSouth	Install: $1104 Monthly: $280.50	Will be installed on or about 31 Jan	Requires ISDN access at Jones Intercable facility at same costs and an ISDN modem ($1500)
DS-1/2T-1 (1.544Mbs) Service from BellSouth	Install: $1,473.50 Monthly: $849	7-14 days	Requires DSU at Jones Intercable ($300-$400)

Discussion of the options ensued. Some members believe Option 2 provides an attractive demonstration for the Forum since a live connection could be made from Washington D.C. to Eisenhower. Mr. Burrow suggested pursuing the ISDN solution while trying to work out Option 1. Dr. Stachura asked how these two services impact on patient care, which is the primary deliverable for the project. Mrs. Adams stated her opinion that option 2 expands the scope of work for the project. Dr. Grigsby suggested that the Steering Committee vote on which option to use. Mr. Horner asked what the time line for Option 1 if there is no 6 week delay. Mr. Burrow responded that it would take two weeks to put in access to Jones, and then training and testing would make it three weeks to have a working line. LTC Schlachta disagreed that using the ISDN line expanded the scope of work and in fact believes it meets the fourth task of the project.

Mrs. Adams made a motion that the Steering Committee review the fourth task and determine if using ISDN lines is within the scope of the project and if funding can support it.

Dr. Grigsby seconded the motion.

Dr. Sanders mentioned that functionality is independent of system communications, and that the project did not originally select ISDN lines because they were not available. He had initial communications with Mr. Bill Smith of Bell South and believes Mr. Smith might be convinced to provide ISDN lines and a modem free of charge.

Mr. Burrow again indicated his opinion that it is to our advantage to show that the communications can be done two different ways. Dr. Grigsby stated that the Steering Committee needs to act on this today and decide if funds are available to reallocate to this. Mrs. Adams made two points: 1) She is concerned about a non-integrated system and 2) A monthly cost of $200-300 for Jones may be required. There are no identified funds to cover this. LTC Schlachta recommended pursuing Option 2 (ISDN) in the interest of time and in meeting task #4 of the proposal. Mr. Horner offered to loan an inverse mux with an ethernet port which EAMC recently purchased, and stated that EAMC has already ordered ISDN lines which they will be supporting financially and which may be used temporarily for this project.

Dr. Stachura summarized the discussion: Option 1 using Jones would be the first choice, but until this works out, Option 2 will be implemented as an alternate solution. Now the group needs a dollar figure on what the technical people are able to spend based on an assessment of the budget.

Mr. Peifer indicated that although the ISDN solution expands the capabilities, the Jones solution would be easier, and network performance is a consideration. Some of the software will have to be modified for use with ISDN.

Mrs. Adams reiterated her understanding that EAMC is absorbing the cost of their ISDN lines and providing the inverse mux for use in this project. She asked if Jones is able to work out the cable connection, would they want to switch over to use this. Mr. Horner replied that they would want to switch over. Mr. Colwell stated that Jones would have a $270 monthly line cost. Mrs. Adams stated that there are currently no funds available for this in the Cooperative Agreement. Dr. Grigsby suggested that since it would be only for a few months perhaps some could be reallocated.

A motion was made to reallocate up to $2500 for installation of one ISDN line and monthly cost through June 30, 1996. EAMC will provide their ISDN line and loaner I-Mux for a period not to exceed June 30, 1996.

The question was asked if this arrangement allows an MCG nurse to patient connection and EAMC nurse to patient connection simultaneously. The answer was yes, it does.

Mrs. Adams asked if we are compromising the confidentiality of patients using this type of line. Mr. Colwell answered that anyone could get in with the necessary equipment but it is very

unlikely. The addition of ISDN lines does not make the confidentiality any more compromised. The point was made that through this connection, an EAMC patient could connect to MCG or an MCG patient to EAMC.

Mr. Toler asked who would contact BellSouth. Mrs. Adams explained that initially, BellSouth offered to provide ISDN lines with the stipulation of exclusive use of the lines (cutting out Jones). Mr. Burrow volunteered to call. Mr. Horner indicated that if BellSouth does offer equipment or lines, he would want to accept.

Mr. Toler mentioned that they have had many visitors interested in this project and that everyone seems to think this is the only one of its kind. It is important to think about how we can stay ahead of everyone else, and make a commitment to maintain our position.

LTC Schlachta indicated that she thinks this is important to demonstrate to Commander Greenauer and if a working station is implemented in a home, she asks that a video clip of a patient using the system accompany the February monthly report. Mrs. Adams asked if each institution could get a copy of the videotape and put together a portfolio of EHC photos, etc.

Mrs. Adams asked that a Training Subcommittee be formed to implement the training of the patients and setting up of training rooms at each facility. Mr. Toler asked if this could be encompassed within the Operations Subcommittee. Mrs. Adams stated that with the addition of a clinical person, the Operations Subcommittee would be able to plan the training. LTC Schlachta suggested that training of patients be conducted by the monitor nurse in their homes. Dr. Grigsby agreed with the concept of using the home setting. He suggested that the equipment could be placed in the home before the actual connections are made for the patient to get used to how it works. Mrs. Adams mentioned that this had been discussed earlier and it had been decided not to do the training in homes because they would have to have the system uninstalled in case they change their mind. Mr. Toler asked the Operations Subcommittee to take on training and add clinical members as needed.

Need for Milestone Chart
Mr. Toler asked each Subcommittee chair to provide a milestone chart which will be compiled to form a project master chart.

Finalize issues related to number, location, staffing, etc. of central monitoring stations.
Dr. Stachura summarized that the Clinical Subcommittee agreed to two primary sites for nurse monitoring; one at EAMC to monitor EAMC patients in their homes and one at MCG to monitor MCG patients in their homes and to link to Dr. Jackson's home to the nursing home. The nurse monitors will be responsible for training, monitoring the stations, and records reviews and data collection for evaluation purposes. There has been a difference of opinion on the budget for funding the nurses. LTC Schlachta, Dr. Stachura, and Cmdr. Greenauer have been working on

this problem and considering 1) EAMC does not have resources to staff the station with a nurse, and 2) there are a host of legal issues on monitoring EAMC patients at MCG. Following a review of material with appropriate officials, Dr. Stachura made the following motion: Funding will be provided for one monitor nurse at EAMC through June 30, 1996. The funds needed to support the nurse from Feb.-June 1996 will come from the $25,000 at MCG and $25,000 at Ga. Tech initially allocated for software and interface development at AND Interactive. The motion was seconded and approved.

Dr. Grigsby made the motion to eliminate training rooms and conduct training in the naturalistic setting of patient's homes. It was pointed out that this would free up additional units that would have been assigned to the training rooms and would solve the problem of finding two contiguous rooms at EAMC and MCG to devote to training. This motion was seconded and approved.

The number of units available and their distribution was discussed. The decision was made to allocate the units as follows:

Central Units	**Patient Units**
Dr. Jackson's home	Nursing Home
EAMC station	EAMC patients - 4
MCG station	MCG patients - 3
Ga Tech developmental unit	Ga Tech developmental unit
Backup (Dr. Searle's lab)	Backup (Dr. Searle's lab)
5 central units will be built	**10 patient units will be built**

Mr. Burrow indicated he would purchase off the shelf equipment and create a 16th unit. Dr. Grigsby put the allocation of the systems in the form of a motion which was seconded and approved. Dr. Grigsby mentioned that the agreement states we will serve 25 patients. The above configuration provides service to 7 patients (3 MCG and 4 EAMC). Thus, additional equipment will be needed. It requires 4 weeks to order, complete, and install a unit.

Mr. Horner asked if the research/evaluation data will be skewed by the fact that units are implemented in patients' homes in stages. Dr. Grigsby stated that it would not be skewed. Dr. Grigsby asked if Georgia Tech could identify what has been spent of their portion of the GRA funds in order to determine how many units are possible. After some discussion and assurance that funds were available, the committee approved the motion to direct Georgia Tech to purchase 10 additional units for installation in March.

Mr. Colwell expressed the opinion that if EAMC is to be a full partner in this Project, they will need a complete hardware and software system (patient monitoring unit and a central monitoring station) to work with in their lab. The need for this system had not been identified before and since there is currently a less-than-desired nuumber of systems available, it was decided to

maintain the allocation of systems as defined earlier in this meeting.

Dr. Ward stated that the database may be the most important part of the project and will determine where the project ends up. He asked that whatever is submitted to Cmdr. Greenauer include some information on the planned clinical database. Dr. Grigsby stated that the clinical database should include input from all subcommittees. Dr. Stachura suggested that at the next meeting, perhaps we could focus on the database. LTC Schlachta asked what has been done. Mr. Peifer responded that data can be transferred and stored, and displayed. It is Microsoft Access-based. LTC Schlachta asked if interested people could gather as a working group to discuss the database. Dr. Stachura indicated that he sees this as a core piece of what would be done beginning July 1. Dr. Grigsby stated that the military did not want the project funds to be spent on database development at the outset of the project. Dr. Ward stated his opinion that there is no geriatric database available anywhere and that this would be very important.

Mr. Peifer said the current database structure will have most basic information. LTC Schlachta asked if the Clinical Subcommittee could meet after viewing the demonstration which will be set up this afternoon.

Mr. Toler opened the discussion of future funding. He stated the Army has indicated that "the door is cracked" but has made no promises of funding past June 30. Other sources with commercial interest might be interested in funding follow-on research. Strings are often attached with commercial companies. He asked for the group's opinions. Dr. Ward asked permission to speak to Oracle database company about the project. Dr. Grigsby stated he would be happy to collaborate and consider all sources in everyone's best interest. He asked members to remember that we are developing intellectual property, but it cannot be considered or termed a "product" at this point, due to FDA regulations. Mr. Toler will serve as the clearing house of information for contacting potential funding sources.

LTC Schlachta indicated she would like to discuss issues about potential presentations of this project at professional meetings by members of this Committee or others at their institution. This will be a topic for discussion at the next meeting.

The meeting was adjourned at 11:30 am. The next meeting was set for next Thursday, Feb. 8, 1996, as a video conference from 11:00-1:00.

Respectfully Submitted,

Ann H. Brown

Ann H. Brown, MHSA

updated 2/13/96

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Date: Fri, 26 Jan 96 7:21:52 PST
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National Forum:
Global Telemedicine and Its International Implications

April 2-4, 1996
Sheraton Premiere Hotel, Tysons Corner, VA

The American military health care system extends from the foxholes, ships, and air bases to the military medical centers throughout the United States and abroad. Minimizing the number of American battlefield deaths and providing medical care to all deployed men and women and their dependents around the world are fundamental missions of the DOD medical service. Advanced technologies in imaging, communication, and information systems make it possible to dramatically improve the military's ability to project effective medical care in deployment and peace time settings around the globe.

The National Forum: Telemedicine On-line Today held in March 1995 highlighted many innovative applications of telepresence technologies and established a vision of military leadership. It was a highly successful gathering of over 1,000 people representing the military, government, congress, academia, industry and foreign dignitaries.

The National Forum II: Global Telemedicine and Its International Implications will take place in the Washington, D.C. area, April 2-4, 1996 to report the progress of telemedicine initiatives, review new ideas and technologies and to plan for the future. This National Forum will focus on the global implication of telepresence and the international collaboration with a number of countries. Many military medical leaders from around the world will be invited to the Forum. The Forum will have Plenary Sessions, Workshops, Demonstration of New Capabilities and Commercial Exhibits.

The Association of the United States Army and Georgetown University Medical Center will again organize the National Forum. All interested parties are welcome to participate. We expect it to be another successful conference.

BG Russ Zajtchuk, MD
Conference President and
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EHC Status, 1 February 1996

MCG

Jones will trench and pull fiber to the demarcation point by 9 Feb and activate the link by 15 Feb.

An alpha version EHC prototype system is being delivered for testing today. Tests will be carried out between Dr. Searle's lab and his home using an installed Ethernet-over-cable facility previously installed by Jones.

Salem Nursing Home

Jones will activate AM node, install reverse amplifiers, and test within February.

EAMC

Jones has submitted a plan for internal approval of work to bring a fiber 3.5 miles to Gate 1, trench about 0.1 mile, and hang fiber to the demarcation point. A monthly cost of $200 - $300 has been discussed, but no agreement has been reached. The base commander must provide in writing authorization for Jones to bring the cable on base.

The Center for Total Access has ordered three ISDN lines and plans to test using the EHC equipment and dialing up similar ISDN facilities at the Bioengineering Lab at Georgia Tech. Neither Jones or MCG plan to have ISDN facilities.

GSTP												
	February				March				April			
1. Site Visit Installation/Implementation Plan	X											
2. Site/Room Actions Painting • Lighting • Electrical HVAC • Window Blockage Room Phone • Floor Covering Oto/Oph • X-Ray Box • Bed Coordinator • Contract						X						
3. Lines Installation									X			
4. System Installation Equipment/Cabinets Validation Training										X	X	X
Installation, validation, and training duties depend upon completion of site actions.												

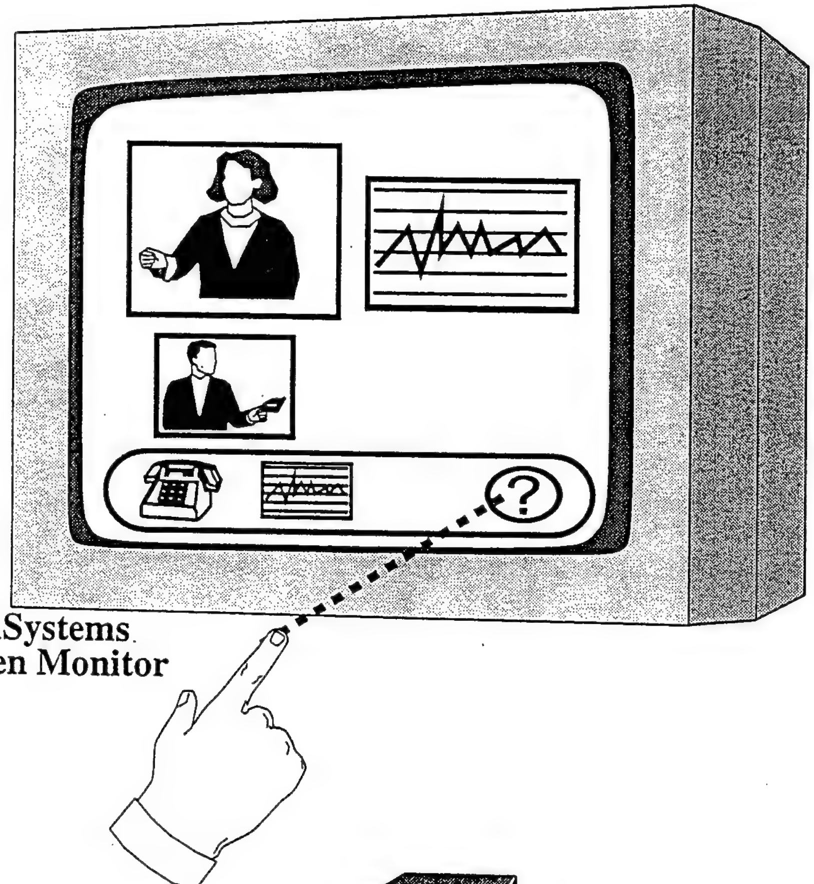
EHC

<u>Sites Are Responsible For Selecting Room</u>

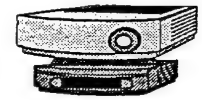
• Monitoring Room (small office cubicle; painting, desk and work surface) •

• Training Room (minimum 12'x12'; couch and easy chair) •

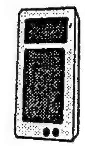
ELECTRONIC HOUSE CALL HOME STATION



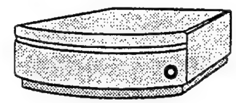
Elo TouchSystems
Touch Screen Monitor



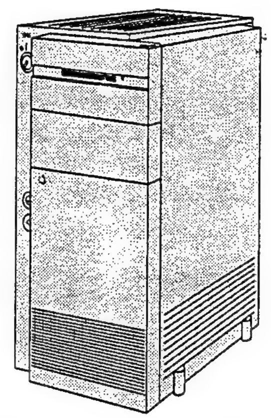
Canon VC-C1 Pan/Tilt Camera



Call Port Microphone speaker for
Intel ProShare System



RF Modem: Model LANHWU-4M
Zenith HomeWorks



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Cards:
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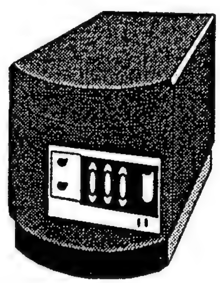

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AGENDA AGENDA AGENDA

for the

ELECTRONIC HOUSE CALL PROJECT

STEERING COMMITTEE MEETING

February 8, 1996
11:00 am - 12:45 pm
Video Teleconference

CALL TO ORDER AND WELCOME

1. **CONFIRMATION OF A MEETING QUORUM**

2. **APPROVAL OF MINUTES FROM FEB. 1 MEETING**

3. **ANNOUNCEMENTS**

   - o Tele-Home Care Conference, Denver, CO, March 14-15, 1996
   - o ATA Annual Telemedicine Conference, Albuquerque, NM, February 23-24, 1996
   - o Postponement of EHC article by Ann Hardie in Atlanta Journal/Constitution
   - o Invitation to Ms. Schlachta to participate in the 19th Annual National Conference on Rural Health, May 18, 1996 in Minneapolis, MN (Session on "Nurses and the Information Superhighway: *Designing the Highways and Byways to Provide Nursing Care - Telenursing and Telehealth*")
   - o Confirmation of Ms. Schlachta as speaker at the TM2000: Telemedicine Conference and Exhibition, June 19-21, 1996 in Chicago, IL

3. **INFORMATION REGARDING PARTICIPATION IN THE NATIONAL FORUM: GLOBAL TELEMEDICINE AND ITS INTERNATIONAL IMPLICATIONS, APRIL 2-4, 1996, TYSONS CORNER, VA**

   - o Exhibit Information
     - o $2800 for a 8' x 10' booth with an 8' fabric backdrop, 3' high dividers, and a 44" long sign with the exhibitor's name printed on it
     - o Furniture such as tables, easels, drapes, chairs, lamps, etc. plus other items such as a VCR, telephone line(s), ISDN line(s), lighting, etc. will be extra, but no cost information is provided on the Exhibitor's Contract Form.
     - o Use of union carpenters and teamsters is required, with separate payment to them. Also, crating, shipping, insurance, etc. will be extra.
     - o Deadline for submitting PREPAID Exhibitor's Contract is Feb. 28, 1996.

- Presentation Information
    - A brief abstract describing the EHC Project has been submitted to Mark Schnur at MATMO. He forwarded it to Dr. S.K. Mun, chair of the Technical Program Committee and located at George Washington University. Dr. Mun is to let us know about acceptance/rejection.

4. REPORT OF THE CLINICAL SUBCOMMITTEE

- Review of plans for staffing MCG and EAMC Central Monitoring Stations
- Status of milestone chart for the Subcommittee

5. REPORT OF THE TECHNICAL SUBCOMMITTEE

- Status of issues related to cable and/or ISDN links between MCG and EAMC
- Status of telemedicine units installed in Dr. Searle's home/lab
- Status of hardware assembly efforts for initial (Phase 1) installations
- Status of software development efforts for initial (Phase 1) installations

6. REPORT OF THE OPERATIONS SUBCOMMITTEE

- Status of plans for patient selection
- Status of plans for patient training
- Status of milestone chart for the Subcommittee

Electronic House Call Project
Steering Committee Video Conference Meeting
February 8, 1996
11:00 am

The Steering Committee of the Electronic House Call Project met on Thursday, February 8, 1996, via Video Conference between Georgia Institute of Technology and Medical College of Georgia.

Members Present	**Institution**
Mrs. Laura Adams	Medical College of Georgia
Mr. Mike Burrow	Georgia Institute of Technology
Dr. Kevin Grigsby	Medical College of Georgia
Mr. Jack Horner	Eisenhower Army Medical Center
Mr. John Peifer	Georgia Institute of Technology
Dr. Dan Rahn	Medical College of Georgia
LTC Loretta Schlachta	Eisenhower Army Medical Center
Dr. Max Stachura	Medical College of Georgia
Mr. Jim Toler	Georgia Institute of Technology
Dr. Dan Ward	Eisenhower Army Medical Center

Members Absent	**Institution**
Dr. Betsey Blakeslee	Eisenhower Army Medical Center
Dr. Jay Sanders (Ex-officio)	Medical College of Georgia

Other Attendees: Mrs. Ann Brown, Recorder, Mr. Vince Colwell, (EAMC), Mr. Harry Hess, (Jones Intercable), Dr. John Searle, (MCG), Mr. Barry Sudduth (Ga Tech).

Welcome
Mr. Jim Toler, Chairman, called the meeting to order and introduced the group. He reviewed the agenda and asked for any changes. There were none.

Confirmation of Quorum
Mr. Toler asked Mrs. Brown to confirm that a quorum of members was present. She confirmed that the requirement of two members representing each institution was met.

Approval of Minutes from Feb. 1 Meeting
Mr. Toler asked members to forward changes to Mrs. Brown as soon as possible.

Announcements
<u>Conferences</u>
Information on several upcoming telemedicine-related conferences is included on the Agenda. Ms. Schlachta will be in contact with members about information about this project to provide at future speaking engagements at *Telemedicine 2000* in June, and the *Office of Rural Health*

Policy Conference in May.

Information Regarding Participation in the National Forum: Global Telemedicine and its International Implications, April 2-4, 1996, Tysons Corner, Va.
Mr. Toler provided exhibit information on the Agenda. He added that he assumes a table and chair will be provided. Extras such as electricity or phone lines will require additional expense. Mr. Toler asked Dr. Stachura if he has received any information from Cmdr. Greenauer about our participation. He responded that he will contact Cmdr. Greenauer and suggested the group determine what the optimal and minimal levels of participation would be. Ms. Schlachta stated that she spoke with Cmdr. Greenauer and he is waiting to see what the financial requirement will be before deciding about providing the funds. Mr. Toler suggested that this be discussed outside the meeting and the committee will let Cmdr. Greenauer know what the desired level of participation is. Mr. Horner offered to check into a military exhibit rate.

Report of the Clinical Subcommittee
Dr. Stachura stated that the Subcommittee is now operating under the assumption that there will be a connection with EAMC. The goal is to have patients connected by Feb. 29. He met with the physicians performing the study and they are now selecting patients. They hope to have initial patients named by next week. (These patients will be living inside the geographic area Jones indicated.) There will be a minimum of one patient from EAMC and one from MCG to ensure that cabling can occur and be on line by the end of the month. Ideally they will identify enough patients for all the available units. He further explained that there was an oversight at the last meeting when calculating the distribution of units. Dr. Jackson's office on campus will need a monitoring station in addition to the others listed. Thus, of the fifteen available units, there will be 6 monitoring units and 9 home units produced. Mr. Sudduth stated that there may be a software problem with a home unit (nursing home) being supported by two monitoring stations (Dr. Jackson's home and office). Dr. Searle responded that they would not be in use simultaneously so it probably would not be a problem. Dr. Stachura reviewed that once the patients have been advised of the project, it will require two weeks for cabling. The training for the nursing home employees will be in one or two day time sessions where all the employees can come in and participate. Dr. Stachura restated the goal for patients to be identified, cabled, and hooked up by Feb. 29.

Ms. Schlachta and the Clinical Subcommittee will make the decision on the order of patient connection. They would like to have all homes connected by April for a few months of monitoring. The expectation is for each patient to make 1-2 connections to the monitoring station per week.

Dr. Stachura indicated that some of the physicians have anticipated a problem. There is no system for verification of equipment. For example, they assume the stethoscope will be reliable, but are not sure. The Clinical Subcommittee proposes that first, the Nurse visit the patient to

observe monitoring, and perhaps the physician will join. The home visits will provide an opportunity to confirm the settings on the equipment, and to see that the patient is comfortable with the equipment. Afterwards, the connections will begin.

They hope to go to 24 hour, 7 day per week monitoring if funded after July 1. Dr. Stachura believes patients will connect for scheduled monitoring, emergency monitoring, and to see if the nurse monitor is available (to be sure the system works).

Mr. Toler asked if anyone believes that Cmdr. Greenauer would feel we are being too slow or cautious in adopting this action of home visits prior to implementing the system. Dr. Stachura replied that this doesn't seem to slow down the process, it would add another "check" to be sure it works properly.

Ms. Schlachta indicated that she believes it will help to validate the system.

Dr. Grigsby stated he agrees, that for evaluation purposes it is best to evaluate the system three ways: 1) with the patient in the home - live; 2) with the equipment in the home but not transmitting; 3) transmitting the information through the communications lines to the monitoring system. This will provide enough data to show the reliability of the system.

Mr. Toler announced that the Clinical Subcommittee's recommendation of adding home visits to increase the reliability of the system will be adopted.

Report of the Technical Subcommittee
Mr. Burrow announced that the ISDN connection between EAMC and MCG is implemented. Dr. Searle ordered three ISDN lines to connect to the campus Ethernet. Mr. Horner reported that the Multiplexer EAMC had ordered and offered to loan for this project would not support the system, so they have changed the order and will be receiving two which will meet the needs of this project. The multiplexers are to be delivered Feb. 12. The time for the ISDN lines to be connected is within 2 weeks. Dr. Searle will follow the status of the lines. Mr. Hess stated that a cable connection between EAMC and MCG could be made. Mr. Horner stated that the hope was to pursue both a cable and ISDN connection, using the ISDN as a test. The major obstacle to this is cost. Drs. Stachura and Searle indicated that the cable line to EAMC costs $40,000 to install. In order to recover this, a contract or a recurring monthly cost would be needed. Mr. Horner responded that it seems difficult to justify this cost. Mr. Hess announced that the Jones Intercable executives are currently discussing the possibility of reducing this cost. For now, EAMC will loan the I-mux and lines for the extended period of this project.

Mr. Toler asked if the ISDN option is used, are the requirements of the Cooperative Agreement being met. Dr. Stachura said that the requirement of the contract is for service, not specifying the type of connection. The only change is the type of connection to EAMC.

Ms. Schlachta stated that in her opinion it meets the requirement and adds the fourth task (desktop capabilities); thus she believes we have enhanced the deliverables.

Mr. Horner stated the performance of the ISDN lines has been high and he believes it will support the system.

Mr. Peifer stated that he has a slight reservation about using the ISDN lines due to a small loss of information he anticipates by running Proshare at a higher bandwidth.

Mr. Horner asked if the Steering Committee is successful at extending funding for the project, he would be interested in trying different types of connections such as Isoethernet.

Dr. Stachura stated that this is a change to the original agreement; although continuing to pursue both ISDN and cable for the long term, we have shifted to ISDN for the short term solution of connecting EAMC.

Mr. Colwell distributed a diagram he prepared to indicate which institution is providing what portions of the connection and equipment. Members stated they would like to look at the diagram and discuss it at the next meeting.

Ms. Schlachta asked Mr. Hess to confirm the home installation time. He stated it take two weeks at the most.

Mr. Burrow stated they are working on "bugs" in the prototype and are hoping it will become more stable.

Mr. Toler asked him to list things that work well and those that are not working so well at this point. Mr. Peifer responded that the videoconferencing works well and that overall the video is better than the audio component. The blood pressure, oximetry, and temperature transmit well. They are continuing to test other parts of the prototype.

Mr. Toler asked for a report on the assembly of units. Mr. Burrow stated that the hardware and assembly are going well. The software and cards are being tested and he plans to have units assembled for demonstration. He also stated that he will have a 16th unit assembled as a monitoring station.

Mr. Sudduth reported that the electronic stethoscope is almost impossible for the patient to position without instruction from the monitor station. This will require a headset to hear the monitoring station. He asked if the committee wants to add a headset to the system.

Dr. Stachura stated that during training the patients can be instructed on where to place the scope

and how much pressure is needed. His opinion is that for the short term the current system should work without the complication of the headset. Mr. Sudduth stated that the biggest problem is that the patient cannot hear the sounds being transmitted.

Mr. Peifer suggested that a demonstration be held next week on the 15th or 16th. There will be two systems to test at MCG. Mr. Burrow stated that they would proceed without adding headphones but the technical subcommittee felt they needed to make the clinical subcommittee aware that they have serious reservations about the value of the stethoscope without the headphones.

A demonstration will be held at 3:00 on the 16th with the Steering Committee Meeting following the demonstration.

Dr. Ward asked if a demonstration over video conference could be worked out. Mr. Peifer answered that the hands on demonstration would be valuable.

Dr. Rahn asked what it would take to include the headphones for use with the stethoscope. Mr. Sudduth replied that it comes with a headphone and jack. The engineers would have to figure out where to mount the phones on the system. Dr. Rahn suggested that the clinical subcommittee should believe the technical subcommittee since breath and heart sounds will be important in the study. He proposed that the phones be added. The committee agreed.

Ms. Schlachta suggested the word "icon" be changed to "picture" for simplicity. She asked if counters can be attached to the components to determine how many times they are used. Mr. Toler responded that the technical people would look at this.

Operations Subcommittee Report
Mrs. Adams apologized for omitting Mr. Peifer's name from the subcommittee during the last meeting. She reported that the Operations Subcommittee met and will need the clinical protocols to be sure all aspects of the project are being considered from an operational and administrative standpoint. The committee has identified items to work on:

1) Identification of patient (clinical function)
   The Operations Subcommittee will provide information for the physicians to provide to patients such as photographs of the prototype. Consents will be signed at the same time.
2) Visit to homes - Polaroid photographs will be taken of the room and the following will be noted - presence of 3 pronged outlet, window placement and covering, wall color
3) Delivery - phase one training (this will be non-interactive - cable will not be in yet.)
4) Cable connection - phase two training.
   (The goal is for the patient to be well-informed from the beginning to reduce dropouts.)
5) Monitoring
6) Removal of system from home.

She asked who would be providing technical support and who would develop a protocol for addressing malfunctioning systems. The Operations Subcommittee recommends that EAMC and MCG develop a pool of engineers who can be responsive on a short term basis. Mrs. Adams asked the Technical Subcommittee to respond to these questions.

The technician will install the system with the nurse present. Once the cable connection is done, a technical check will be required. The Operations Subcommittee needs to plan for who will complete this. Mr. Peifer has begun to develop a training manual. The training will be completed in a short time. If one patient is ready, they can be used as a "test trainee."

Dr. Grigsby stated that the only person who can obtain consent is the Principal Investigator or the Co- Principal Investigator. Thus, each physician has a consent form with his or her name on it. Each physician will have to obtain the consents for their own patients.

Mr. Horner asked if we need to admonish clinicians to select patients who will be receptive. This was seen by the group as being very important. Mr. Horner asked what the easiest way is to get information for patients who will be approached soon. Mr. Peifer will send the photographs and text to MCG through the FTP and Ms. Schlachta will pick up a copy (original photographs) this afternoon.

Mr. Burrow responded that the Technical Subcommittee would work on a maintenance plan.

Mr. Toler asked the Subcommittee Chairs to provide information for the milestone chart. Dr. Stachura replied that he had faxed one earlier in the day. Mrs. Adams offered to integrate the clinical with the operational and send one. Dr. Grigsby stated that the evaluation time line is contingent upon the operations of the system.

Dr. Grigsby mentioned that a letter has been sent to Jeanne Shinburn for a change in the Principal Investigator, but he has not heard back and is expecting a written approval to attach with the Human Subjects information. He asked Mr. Horner to check into this with the Army.

Mr. Toler mentioned that future meetings will be recorded.

The next meeting will be held next Friday, February 16, at MCG beginning with a demonstration at 3:00.

Action Items from February 8 meeting:

1) Dr. Stachura to communicate with Cmdr. Greenauer on financial support for participation in National Forum.
2) Mr. Horner to check into reduced military rate for exhibit at National Forum.

3) Physicians to begin identifying patients this week and next week.
4) Dr. Searle to follow status of ISDN lines ordered.
5) Mr. Horner to anticipate delivery of multiplexer Feb. 12.
6) Technical Subcommittee to stay in contact with Jones Intercable regarding possible reduction in $40,000 cost to install line.
7) Members to review distributed drawings of system and be prepared to discuss at next meeting.
8) Engineers to work on adding headphones to prototype for use with stethoscope.
9) Operations Subcommittee to provide information to physicians for use in recruiting patients.
10) Technical Subcommittee to consider questions raised by Operations Subcommittee about maintenance of units.

Respectfully Submitted,

Ann H. Brown

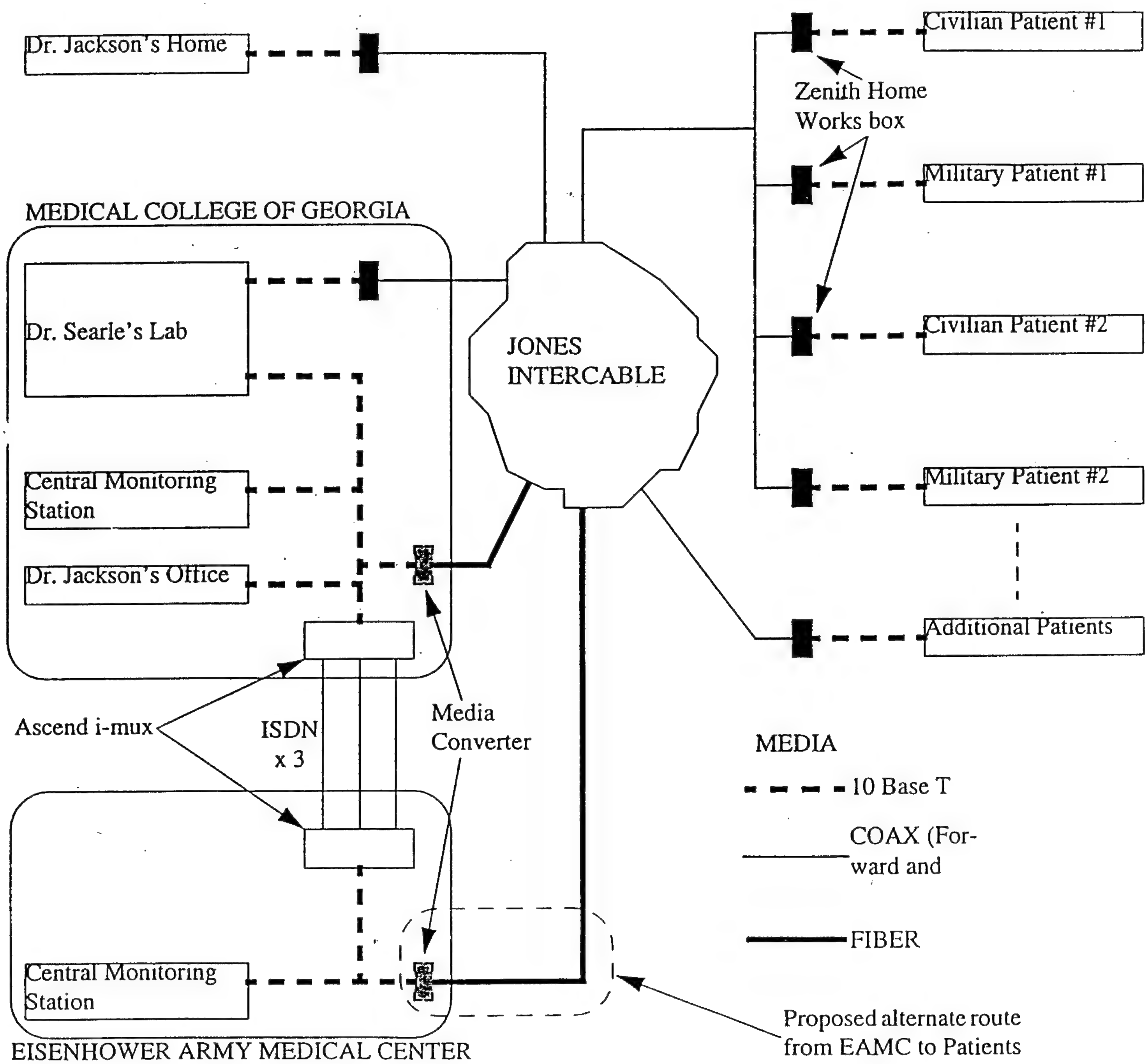
Ann H. Brown, MHSA

2/21/96

ELECTRONIC HOUSE CALL

WIDE AREA ETHERNET CONFIGURATION

8 February 1996



Clinical Subcommittee 02/07/95

Patient Selection:	Initial: 2/7-2/12 Ongoing: 2/12 - 4/31
Patient Cabling:	Initial: 2/12-2/28 Ongoing: 3/1 - 4/31
Patient Education:	Initial: 2/12-2/28 Ongoing: 3/1 - 4/31
System Hookup:	Initial: 2/23-2/28 Ongoing: 3/1 - 4/31
Visits:	2/23 - 6/30

Initial visits will be conducted by physicians AND nurses/PAs at 1-2/wk, with in-home verification as required.

Patient and Practitioner comfort with the system will evolve over weeks to the point where nurse/PA will conduct the visit with the physician on call.

Verification and experiencw with the system once it is on-line should permit round-the-clock scheduled/emergency coverage to become the heart of the proposal from 1 July onward.

AGENDA AGENDA AGENDA

for the

ELECTRONIC HOUSE CALL PROJECT

STEERING COMMITTEE MEETING

February 15, 1996
Telemedicine Center Conference Room
Medical College of Georgia
2:00 pm

CALL TO ORDER AND WELCOME

1. **CONFIRMATION OF A MEETING QUORUM**

2. **APPROVAL OF MINUTES FROM FEB. 8, 1996 MEETING**

3. **ANNOUNCEMENTS**

   o ATA Annual Telemedicine Conference, Albuquerque, NM, February 23-24, 1996
   o Tele-Home Care Conference, Denver, CO, March 14-15, 1996
   o Global Telemedicine and Federal Technologies Symposium and Exhibition, Williansburg, VA, July 8-10, 1996

4. **STATUS OF PLANS FOR PARTICIPATING IN *NATIONAL FORUM 96: GLOBAL TELEMEDICINE AND ITS INTERNATIONAL IMPLICATIONS*, APRIL 2.4, 1996, TYSONS CORNER, VA**

   o Cost estimate has been prepared for use in seeking funds through Cmdr. Greenauer
   o Continue to wait on Dr. Mun, Chair of the Technical Program Committee, regarding platform presentation
   o Report on any EAMC formation regarding possibility of booth being rented through the military at a cost less than $2,800

5. **REPORT OF THE CLINICAL SUBCOMMITTEE**

   o Comments on demonstration of home-based unit and central monitoring station
      o Required changes prior to use
         o Hardware o Software
      o Changes desired as soon as possible
         o Hardware o Software

- o Long-term changes
  - o Hardware
  - o Software
- o Status of patient identification efforts
- o Need for milestone chart

6. **REPORT OF THE EVALUATIONS SUBCOMMITTEE**

- o Need for milestone chart

7. **REPORT OF THE OPERATIONS SUBCOMMITTEE**

- o Status of recruiting and training materials for patients
- o Need for milestone chart

8. **REPORT OF THE TECHNICAL SUBCOMMITTEE**

- o Status of communications link between MCG and EAMC
  - o Cable link--any new information from Jones Intercable
  - o ISDN link (EAMC installation, MCG installation)
- o Comments on V. Colwell diagram depicting telecommunication equipment and its interconnection
- o What is/isn't going well with development of home-based units and central monitoring stations
  - o Heart/lung sound measurements
  - o Temperature measurements
  - o Weight measurements
  - o Oximetry measurements
  - o EKG measurements
  - o Blood pressure measurements
  - o Lighting
  - o Cabinetry
- o Plans for home installations
- o Thoughts on/plans for handling malfunctioning systems
  - o Removal from homes
  - o Repair/return to service

9. **COMMENTS/THOUGHTS REGARDING PREPARATION AND CONTENT OF FEB. 29 PROGRESS REPORT TO SPONSOR**

10. **REVIEW OF ACTION ITEMS**

11. **PLANS FOR NEXT STEERING COMMITTEE MEETING**

- o Time
- o Place

Electronic House Call Project
Steering Committee Meeting
February 15, 1996
2:00 pm

The Steering Committee of the Electronic House Call Project met on Thursday, February 15, 1996, at Medical College of Georgia Telemedicine Center.

Members Present	Institution
Mrs. Laura Adams	Medical College of Georgia
Mr. Mike Burrow	Georgia Institute of Technology
Mr. Jack Horner	Eisenhower Army Medical Center
Mr. John Peifer	Georgia Institute of Technology
Dr. Jay Sanders (Ex-officio)	Medical College of Georgia
LTC Loretta Schlachta	Eisenhower Army Medical Center
Dr. Max Stachura	Medical College of Georgia
Mr. Jim Toler	Georgia Institute of Technology
Dr. Dan Ward	Eisenhower Army Medical Center

Members Absent	Institution
Dr. Betsey Blakeslee	Eisenhower Army Medical Center
Dr. Kevin Grigsby	Medical College of Georgia
Dr. Dan Rahn	Medical College of Georgia

Other Attendees: Mrs. Ann Brown, Recorder, Dr. John Searle, (MCG).

Welcome
Mr. Jim Toler, Chairman, called the meeting to order and introduced the group. He reviewed the agenda and asked for any changes. There were none.

Confirmation of Quorum
Mr. Toler asked Mrs. Brown to confirm that a quorum of members was present. She confirmed that the requirement of two members representing each institution was met.

Approval of Minutes from Feb. 8 Meeting
Mr. Toler asked members to forward changes to Mrs. Brown as soon as possible.

Announcements
<u>Conferences</u>
Mr. Toler reminded members of several upcoming telemedicine-related conferences which are included on the Agenda.

Status of Plans for Participating in the National Forum 96: Global Telemedicine and its International Implications, April 2-4, 1996, Tysons Corner, Va.
Mr. Toler provided a cost estimate of $7,027 for one person to exhibit at the conference. An additional person will cost $745. This includes the ISDN connection, exhibit needs, van rental, and gas. Mr. Horner announced that the Army cannot obtain a discounted exhibit rate. Dr. Stachura stated that Ms. Schlachta spoke with Cmdr. Greenauer and he is waiting on a proposal from the Steering Committee before deciding about providing the funds. He does not favor funding the entire effort. The suggestion was made to reduce the proposal to him by the amount already in the budget (for the kiosk demonstration previously planned). Mr. Toler asked the Operations Subcommittee to look at both budgets (MCG and Ga. Tech) to see if there is a way to pay for the trip out of the current budget. No one has heard from Dr. Mun, Chair of the Technical Program Committee regarding the platform presentation. The Committee will continue to wait until hearing from him.

Report of the Clinical Subcommittee
Mr. Toler introduced engineers who have been working on this project. They are: Barry Sudduth who works with Mike Burrow on hardware issues, Andy Hopper who works with John Peifer, and Sam Panchall who works with Jim and with John Searle. Dr. Stachura announced that he delivered the clinical protocols for the scheduled visits. Patients names have been identified at EAMC and at MCG. John Searle will work with Jones Intercable to get one patient from each site installed and working by the Feb. 29 deadline. The IRB statement from EAMC has not been received yet. The MCG IRB pediatric assent and consent must be on two separate pieces of paper, which will be completed and forwarded to the IRB. The Subcommittee is developing packages of information and the consents for physicians. MCG lost the contract for the Salem Nursing Home, which means Dr. Jackson no longer is Medical Director there. He still can admit and care for patients at that nursing home, however. Dr. Stachura has a verbal commitment from Dr. Jackson and the nursing home to go ahead with the project (through June 30) They expect consents from 20-25 nursing home patients. Other options are available. Another nursing home near Dr. Jackson's home, Westlake Nursing Home, is interested in participating. Dr. Jackson has 25 patients there he believes would be interested. Dr. Stachura made a verbal inquiry with the director and if technically feasible, they are willing to sign an agreement to participate. Mr. Harry Hess of Jones is to look into which nursing home will be easier to use. Jones may cable both, allowing the Committee to work with either or both. The project is still on track for a connection with a nursing home by the end of the month.

Dr. Stachura stated that he needs advance approval of the Committee to go forward with whatever works the best. Mrs. Adams stated that it is encouraging to have two nursing homes to possibly use, but we need to look at the budget to see if can support this. Ms. Schlachta asked how switching nursing homes changes the IRB. Dr. Stachura responded that he does not know if a change will be needed. It would only affect MCG, not EAMC. Dr. Stachura moved that the Clinical Subcommittee be given authorization to pursue a change in the commitment from Salem

to Westlake Nursing home if it can be accomplished with out detrimental effects to the project as currently developed. This motion was seconded and approved.

Operations Subcommittee Report
Mrs. Adams reported that Mr. Peifer sent out a draft of information for physicians to provide to patients about the project. She asked for changes as soon as possible so the information can be finalized. The Operations Subcommittee will be outlining a general clinical protocol for operation of the "connections." The Clinical Subcommittee provided copies of the protocol they have developed for patients, and Dr. Stachura explained that each patient would be considered individually and each physician would expand the clinical protocol for the patients as they are identified. Mrs. Adams explained that along with the training packet and instructions for use of the equipment, the protocols would be used to put a user manual together if a manual is desired. Members discussed the need for a manual and concluded that they do indeed want a manual and suggested including a checklist for those using the equipment. Ms. Schlachta suggested that in terms of patient materials, if the system is user-friendly, there won't be a lot of text needed for patients. Mrs. Adams explained that text is needed for trainers and a standardized format is desired.

She then reviewed the time line or phases of the study:
Site visit to home - once patient has been identified
Phase 1 - "pre" training (before equipment is installed)
Phase 2 - interactive training (after equipment and connection are installed)

Mrs. Adams suggested that Jones identify the homes of patients they will target for "early" installation (< two weeks) and the site visits can begin at these homes. She asked if there is a point of contact from the Technical Subcommittee once the patient is identified. It is John Searle. Mrs. Adams further stated that the Operations Subcommittee will provide a checklist for a quick site visit. Dr. Searle suggested the visitor take along a laptop computer to plug in to be sure there is a live outlet. Mrs. Adams suggested that the technical people may want to conduct the site visits.

Report of the Technical Subcommittee
Mr. Burrow announced that the ISDN connection between EAMC and MCG is implemented. Mr. Colwell is checking on the delivery of the I-mux which was expected today. The technical committee will try to determine if the electronic housecall operates over 386 mb between EAMC and Georgia Tech. Dr. Sanders informed the committee that BellSouth asked if they could provide the ISDN lines for the nursing home, so if there is a problem with the cable of the new nursing home, he suggested contacting Gary Coleman about BellSouth providing this instead of Jones. Dr. Searle announced that DOAS ordered the ISDN lines and is trying to expedite the 10 day delivery. He will obtain the order number to get a report on the installation status. Ms. Schlachta suggested he contact Sally Williston who has assisted EAMC in obtaining timely

installations. The Technical Subcommittee is continuing to update the network diagram distributed at the last meeting. The committee will leave the demonstration units at MCG for the clinicians to work with. Dr. Sanders asked if the sound on the stethoscope is being captured. Mr. Burrow answered that it is not. Dr. Sanders asked if the committee had considered the electrophonocardiogram. Dr. Ward replied that they had looked at it before and he thinks it is the way to go. The signal does not have to be in "real time". Mr. Peifer replied that in earlier discussions the committee stated that "real time" was a high priority. A discussion of the stethoscopes followed. Dr. Searle explained the need to evaluate what has been developed, and then consider looking into other options if needed.

Mr. Peifer asked if being able to store the EKG information in the database is a priority. This will be complicated to develop. The group decided that it would be desirable to freeze the EKG and look at it later or show another provider later. This will not present a problem with storage space in the computer, and could expand the type of patient able to participate.

Mr. Burrow informed the group the engineers are experimenting with different types of lighting. Dr. Sanders suggested contacting Jon Trueblood at MCG, who is a lighting expert.

Mr. Burrow questioned the clinicians on the temperature measurement device. During the demonstration, the length of time needed to take the temperature was mentioned as a concern. Dr. Searle stated that the time constant is less than 30 seconds with the probe only. Using the probe cover lengthens the process to over 2 minutes. He suggested experimenting with different covers. Dr. Stachura suggested that this was not a major concern and need not be addressed immediately. Ms. Schlachta stated that a probe cover might not be needed since only one patient would be using each probe.

Mr. Toler stated that the Technical Subcommittee is continuing to work on reproducing the skin tones. He asked for additional comments from the group on the demonstration held prior to the meeting. Dr. Ward suggested a seal, such as a skin adhesive, for the stethoscope to reduce external noise. Dr. Searle asked if there is an override capability in case two calls come through simultaneously. There is not. However, the group discussed the importance of making the patient aware that this is not intended to replace emergency medical care. Mr. Horner asked if a patient calls in and the nurse is busy with another patient, could the screen display a message stating that the system cannot connect. Mr. Peifer responded that this is possible but not currently implemented. Mrs. Adams asked if the database could show the number to call. This could be devised. The Committee discussed scenarios of possible types and reasons for connections and determined that there would be two types of connections: 1) scheduled visits wherein the nurse initiates the connection, and 2) patient call-ins. When the patient calls in and doesn't get a connection or No one is there, a number to call will display in the screen.

Mr. Burrow stated they plan to install one system at EAMC and one at MCG and the nursing

home by the last Monday of the month (Feb. 26.)

Ms. Schlachta stated that she will visit the homes for EAMC patients and will do the checklist.

Comments/Thoughts Regarding Preparation and Content of Feb. 29 Progress Report to Sponsor

Dr. Stachura provided a handout of his plan for the report and reviewed it. He asked for all input by Thursday, Feb. 22. The group discussed the report. Dr. Stachura plans to express mail it on Feb. 29. He reminded the Committee that this will be used to determine funding issues for the project. Mr. Horner asked if any PR action has been taken. Mrs. Adams replied that Toni Baker of MCG will prepare a press release and will contact representatives at the other institutions when doing so. Mr. Burrow suggested a Web page about the project. Dr. Stachura asked for names of people at each institution who have been involved in the project. He will prepare a letter of thanks to send from the Steering Committee.

Review of Action Items

The following action items were stated:

1) Mr. Colwell to contact Jones Intercable regarding possible reduction in $40,000 cost to install line.
2) Dr. Searle to obtain the order number from DOAS for the ISDN line.
3) Clinical Subcommittee to commit to one of the two nursing homes.
4) The Technical Subcommittee to continue to work on the diagram and provide an update.
5) The Operations Subcommittee to provide a checklist to those making home visits and will continue to work on a training manual for the project.
6) The Subcommittee Chairs to provide needed information to Dr. Stachura by Thursday, Feb. 22.
7) Evaluation Subcommittee to check with IRB to see if any changes will be needed if change from Salem to West Lake Nursing Home.
8) Engineers to work on adding headphones to prototype for use with stethoscope.

The next meeting will be held on Monday, Feb. 26, 1996 at 3:00 pm at MCG.

Respectfully Submitted,

Ann H. Brown, MHSA

2/21/96

General Protocol of Electronic Housecall Scheduled Visit
(Specific visit protocols will be developed for each patient)
Draft - 02/14/96

Scheduled Connection;

1. Greeting and general questions about patient well-being and system functionality.

2. System checks as determined by technical requirements

3. Patient condition-specific Review of Systems to include changes since last visit.

4. General Review of Systems to include changes since last visit.

5. Review of medication compliance.

6. Review of patient condition-specific monitoring data collected since last visit.

7. Examination:
   a. Vital Signs - Temperature
      - Pulse rate
      - Blood Pressure
      - Weight
   b. Electrocardiogram/Rhythm as indicated
   c. Pulse Oximitry as indicated
   d. Stethoscope examination of heart sounds, anterior and posterior lung sounds, and abdominal sounds as indicated.

8. Assessment of findings

9. Recommendations/Plan to include
   a. Confirmation of or change in medication schedule
   b. Confirmation of or change in living style requiremts (e.g. diet, exercise, work/sleep schedule)
   c. Necessary patient/significant other education
   d. Answer patient questions
   e. Review procedures for patient activation of system or criteria for patient by-pass of the system and presentation to hospital for emergency care
   f. Review next scheduled office visits,
   g. Schedule next Electronic Housecall visit

Information required for 02/29/96 letter to Cmdr Greenauer

Chairs, Steering Committee
Subcommittees
Clinical (Stachura/Schlachta)
Technical (Burrow)
Operations (Adams)
Evaluation (Grigsby)
GIT-specific General Info (Toler)
EAMC-specific General Info (Schlachta/Horner)
MCG-specific General Info (Stachura/Adams/Searle/Grigsby)

We need to start accumulating information necessary for the critical 02/29/96 report. As I will be in Albuquerque during the end of next week, I need the information by noon Thursday, 22 February.

Please submit your information according to the following general format:

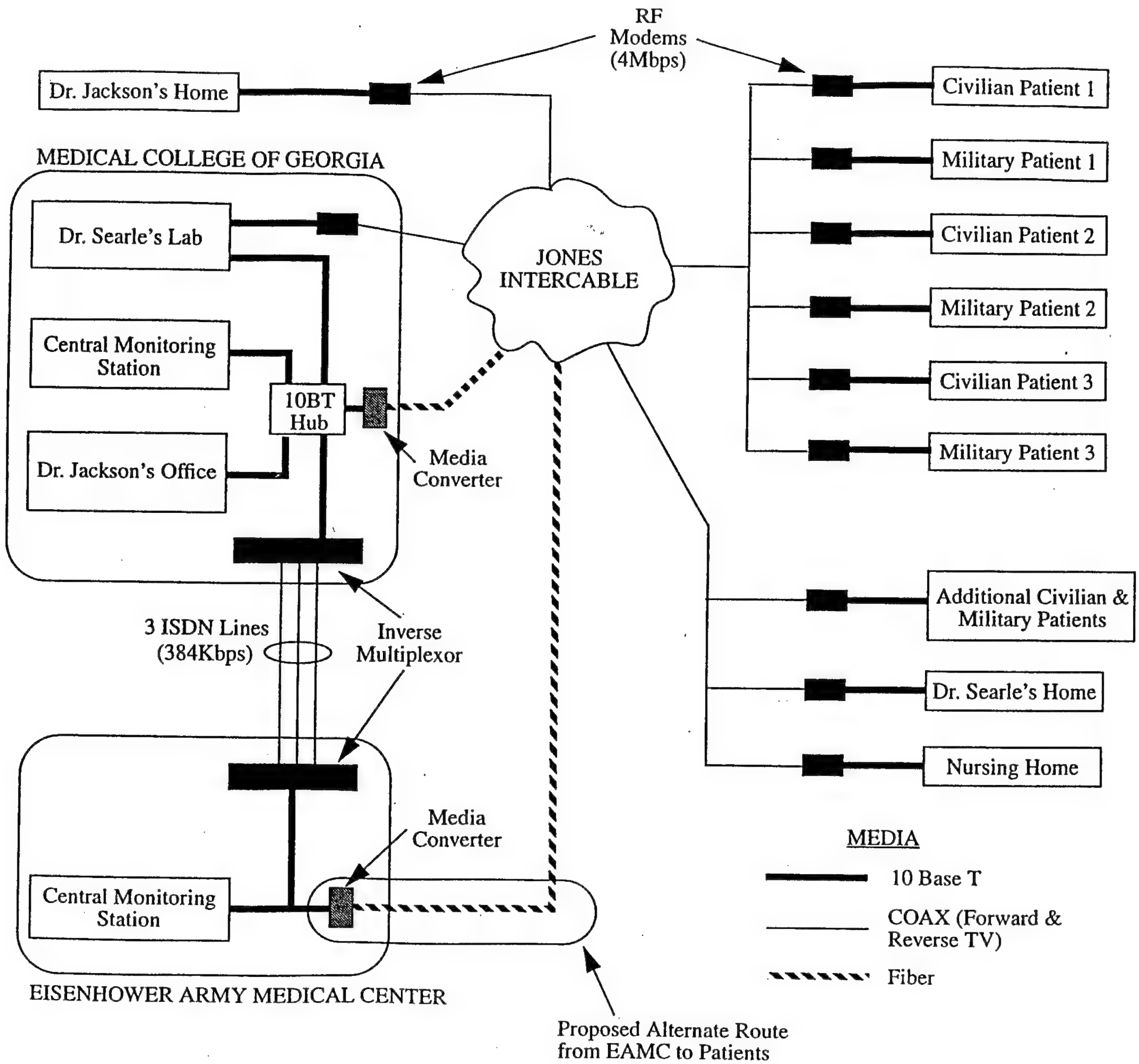
1. Charge to your group
2. *Accomplishments (be a specific as possible) through 02/29
3. *Planned for completion (be positive & specific, but not unrealistic) by 06/30
4. How you would summarize the project if it ends on 06/30
5. An outline of what you would propose to do if the project is extended (with or without funding) beyond 06/30 (assume that it is for one year).

*Attach a copy of all appropriate documentation you believe would add substance to the report (e.g. consent forms, evaluation forms, patient instruction manuals, diagrams of equipment utilized and connectivity, picture of base and home units)

We plan to make an informal video of the units in use at base (EAMC & MCG) and in any connected homes.

ELECTRONIC HOUSE CALL
WIDE AREA ETHERNET CONFIGURATION

16 February 1996



AGENDA AGENDA AGENDA

STEERING COMMITTEE MEETING

FOR THE

ELECTRONIC HOUSE CALL PROJECT

March 11, 1996
8:15 am
Video Teleconference

CALL TO ORDER AND WELCOME

1. **CONFIRMATION OF A QUORUM**--A. Brown

2. **CHANGES TO MINUTES OF FEB. 15 MEETING**--A. Brown

3. **ANNOUNCEMENTS**--J. Toler

   - <u>Tele-Home Care Conference</u>, Denver, CO, March 14-15, 1996
   - <u>National Forum 96: Global Telemedicine and its International Implications</u>, Tysons Corner, VA, April 2-4, 1996
   - <u>Global Telemedicine and Federal Technologies Symposium and Exhibition</u>, Williamsburg, VA, July 8-10, 1996

4. **STATUS OF PROGRESS REPORT TO CMDR. GREENAUER**--M. Stachura

5. **UPDATE ON CLINICAL SUBCOMMITTEE ACTIVITIES**--M. Stachura

   - Identification of nursing home to work with*
   - Continued patient selection

6. **UPDATE ON TECHNICAL SUBCOMMITTEE ACTIVITIES**--M. Burrow

   - Status of units in patient and hospital sites
     - Hardware
     - Software
   - Extension of funding for continued software development and support
   - Status of communications link between MCG and EAMC
     - Contact with Jones Intercable regarding reduction in the $40K cost--V. Colwell*
     - Installation of ISDN lines--J. Searle*

7. **UPDATE ON OPERATIONS SUBCOMMITTEE ACTIVITIES**--L. Adams

- o Status of Training Material preparation*
- o Status of Checklist preparation*

8. **UPDATE ON EVALUATION SUBCOMMITTEE ACTIVITIES**--K. Grisby

9. **DISCUSSION OF PLANS FOR INVOLVEMENT IN NATIONAL FORUM '96**

- o Preparation of poster presentation
- o Preparation of equipment, etc. for exhibit

10. **DISCUSSION OF PLANS FOR PROPOSAL FOR FOLLOW-ON EFFORTS**--All

- o Proposal to Army Medical R&D Command
  - o Due date
  - o Contents
  - o Who preparing/combining materials

- o Proposal to other organizations
  - o Due date
  - o Contents
  - o Who preparing/combining materials

* Action Item from previous meeting.

Electronic House Call Project
Steering Committee Meeting
March 11, 1996
8:15 am

The Steering Committee of the Electronic House Call Project met on Monday, March 11, 1996, via Video Teleconference between Medical College of Georgia and Georgia Institute of Technology.

Members Present	Institution
Dr. Kevin Grigsby	Medical College of Georgia
Mr. Jack Horner	Eisenhower Army Medical Center
Mr. John Peifer	Georgia Institute of Technology
LTC Loretta Schlachta	Eisenhower Army Medical Center
Dr. Max Stachura	Medical College of Georgia
Mr. Jim Toler	Georgia Institute of Technology
Dr. Dan Ward	Eisenhower Army Medical Center

Members Absent	Institution
Mrs. Laura Adams	Medical College of Georgia
Dr. Betsey Blakeslee	Eisenhower Army Medical Center
Mr. Mike Burrow	Georgia Institute of Technology
Dr. Dan Rahn	Medical College of Georgia
Dr. Jay Sanders (Ex-officio)	Medical College of Georgia

Other Attendees: Mrs. Ann Brown, Recorder, Dr. John Searle, (MCG), Mr. Barry Sudduth, (Ga Tech), Mr. Andy Hopper, (Ga Tech), Mr. Vince Colwell, (EAMC).

Welcome
Mr. Jim Toler, Chairman, called the meeting to order and introduced the group. He reviewed the agenda and asked for any changes. There were none.

Confirmation of Quorum
Mr. Toler asked Mrs. Brown to confirm that a quorum of members was present. She confirmed that the requirement of two members representing each institution was satisfied.

Approval of Minutes from Feb. 15 Meeting
The minutes were approved as submitted.

Announcements
<u>Conferences</u>
Mr. Toler asked everyone to note upcoming telemedicine-related meetings listed on the Agenda.

Status of Report to Commander Greenauer

Dr. Stachura reported that he mailed the document, a nine page letter with supporting documentation, by Federal Express on Friday (March 8). He stated that each paragraph addressed points raised in the memorandum he received from Cmdr. Greenauer. He is aware that it has been received and is awaiting their response. He has some concerns, but the items are not under our control. One issue is the military Institutional Review Board (IRB). This issue will not be fixed overnight. He further reported that one week before the original report's due date, he received a letter from General Lanoue (Surgeon General of the Army) stating that the Human Subjects Approval was inadequate. Two points were absolute requirements: 1) the Army personnel will have access to MCG records, and 2) MCG will assume the costs of patient care from any complications resulting from participation in the project. As a state institution, MCG cannot provide this. Possibly the military can provide some type of insurance policy to address this problem. Other points were made, with 30 days given to correct them.

Cmdr. Greenauer instructed us to install units and cable, and train staff, but said we cannot get consents signed and use the system to provide care. Max spoke to Dr. Searle, who stated that there were some technical difficulties with the two that have been installed. Dr. Stachura included in the report that we would stand by while dealing with the technical difficulties; however, Commander Greenauer may see the technical difficulties as a failure to deliver.

Mr. Toler asked if there was any reason to stop the process.

Dr. Stachura responded that there was not any reason to stop. He added that he has instituted a new documentation. Three spreadsheets have been set up. They include: patient information, patient status of consent, equipment, etc., and personnel (clinical, technical, and operational) participating. This will be sent out each week and updated with new patients, etc. Everyone involved will know the status of all patients.

Mr. Toler asked Dr. Stachura to provide each institution a copy of the report submitted. He responded that he made the original and one copy and will provide one to each institution. He further added that on the report, he included a paragraph stating that this document is considered proprietary to protect the information. He offered to fax the nine page letter to Mr. Toler along with the new tables and provide the copy of the entire document once copies are made.

Report of the Clinical Subcommittee

Dr. Stachura reported that the new nursing home site is West Lake Manor Nursing Home. He also reported that physicians are continuing to identify patients.

Update of Technical Subcommittee Activities

Mr. Sudduth reported that there are 7 systems in Augusta: two in homes (pt), two in Dr. Searle's lab (One pt. and one CMS), one in Dr. Searle's home (pt), one at EAMC (CMS), and one in

MCG room 436 (CMS).

He further reported that those at Dr. Searle's lab and EAMC need software updates, and the patient homes need the stethoscope receive unit and need to be upgraded to 32 MB. He will be in Augusta to provide the upgrades and stethoscopes this week. There is trouble with the signal level of ProShare receive. The microphone mixer is between the stethoscope and the ProShare card. The stethoscope puts out more signal than is should, but ProShare isn't receiving at the level it should. The problem of "locking up" the system has been investigated. It is due to the video card. The Diamond Viper Pro card is being used now, recommended by Intel. When replaced with the Matrox Millennium card, this has alleviated the problem. The Technical Subcommittee would like to replace all cards with the Matrox Millennium.

Mr. Hopper reported that Intel had not used the Diamond Viper card with Windows 95 and the EHC system runs Windows 95. Testing with the new card has produced no locking up of the system. They are continuing to work on software bugs. Dr. Searle asked if the frame rate will be ok with the card change. Mr. Hopper replied that he thinks it will be fine. They discussed modifying the Critikon patient monitor so it would come on whenever the power is on.

Dr. Searle stated that some monitors have failed and need to be returned. Mr. Sudduth will switch out monitors when he is in Augusta this week. He stated that a monitor at Ga. Tech has also burned out and this may need to be addressed with the company, Elo. It is a Zenith computer monitor modified by Elo for the touch screen capability.

Mr. Toler reported that he has arranged to extend funding to Mike Sinclair's group for further software development and support.

Dr. Searle reported on the status of communications link between MCG and EAMC. He stated that they have established an ISDN connection to Georgia Tech and have demonstrated two-way audio but it is unreliable. They can only dial up one line. They believe they are getting close to configuring correctly.

Mr. Colwell reported that they need some TCP/IP information. They have one line dialing up because the system is only asking for one. They can load manually through batch files and cannot just assign a gateway. It doesn't recognize the MCG box. They are continuing to troubleshoot and may look to Georgia Tech for some assistance. They will discuss outside the meeting.

Operations Subcommittee Report
In Mrs. Adams' absence, Dr. Stachura reported that a draft Training Manual for patients and operators has been developed and was included in the report sent to Cmdr. Greenauer. The nurses, Wendy Andrews (MCG) and Jean Barnes (EAMC), are working with the equipment.

Ms. Schlachta asked about additional installations in homes.

Dr. Stachura replied that we are on hold due to the IRB problems for MCG, but not for EAMC. She asked if this means on hold for installing in new homes or for using the equipment. He replied that he understands it to mean we could technically install the equipment, but we are having trouble with the units that are in the homes. He believes we would be well advised to be sure the units will work prior to installing any more.

Mr. Sudduth added that nothing is stopping the two currently installed units from being used. The board will be changed and software updated, but they can be used.

Ms. Schlachta stated her concern that in two weeks we will have passed another month, but will have no more progress to show. Dr. Stachura said he agreed with this, and he expects to know today if EAMC can go ahead identifying new patients to be installed.

Ms. Schlachta reported that the protocol has been approved and 7 patients have been consented for EAMC.

Update on Evaluation Subcommittee Activities
Dr. Grigsby reported that the evaluation subcommittee has submitted an evaluation plan in the report to Cmdr. Greenauer. He stated he is distressed by the Institutional Review Board's decision to require paying for patient care. At this point, the project is on hold. He stated we cannot talk with patients about care; can only "test" the system's operation.

Mr. Horner stated that the Army dependent patients will be able to get any care required at EAMC.

Update on Plans for Involvement in National Forum
Mr. Toler reported that the Forum is coming up on April 2-4. This project has been accepted to present a poster and to have an exhibit. The members attending will discuss the poster and exhibit outside the meeting.

Discussion of Plans for Proposal for Follow-on Efforts
Mr. Toler asked for discussion of a proposal for follow on funding. Dr. Stachura stated he understood the proposal was to be incorporated as part of the end of March progress letter. He is waiting for a response from the letter just sent to see if there is an option to prepare an additional request for funding. We need a due date for this. Mr. Toler added that we need to make the submittal very concise. We want to be responsive. He asked if anyone else had any discussion with the Feds to please find out about this.

Mr. Horner stated that Dr. Blakeslee is going to Washington tomorrow and she possibly would

be able to find out. He further added that this funding was Congressional funding through Ft. Detrick. There is no follow up Congressional funding that he knows of.

Proposals to other organizations will be discussed outside the meeting.

Other Items
Dr. Stachura stated that he would follow up to Cmdr. Greenauer's criticisms. He indicated a disclaimer was to be signed by Dr. Sanders promising not to commercialize any part of this project. He has declined to sign such agreement until it has been read by his personal attorney. Dr. Stachura feels it is probably best for each committee member to sign the agreement also. Members should think about items which need to be protected, project "products," and make a list to present at the next meeting.

The next meeting will be held next Tuesday, March 19, 1996, by Video Teleconference at a time to be announced.

A later meeting (one day or half day) will be held to work on the proposal and March progress letter.

Respectfully Submitted,

Ann H. Brown

Ann H. Brown, MHSA

3/19/96

AGENDA AGENDA AGENDA

STEERING COMMITTEE MEETING

FOR THE

ELECTRONIC HOUSE CALL PROJECT

March 19, 1996
1:30-2:30 pm
Video Teleconference

CALL TO ORDER AND WELCOME

1. CONFIRMATION OF A QUORUM--A. Brown

2. CHANGES TO MINUTES OF MARCH 11 MEETING--A. Brown

3. ANNOUNCEMENTS--J. Toler

   o National Forum 96: Global Telemedicine and its International Implications, Tysons Corner, VA, April 2-4, 1996
   o Telemedicine 2000 Conference and Exhibition, Chicago, IL, June 19-21, 1996
   o Telemedicine: New Technologies for Health Care, MIT/Cambridge, MA, April 1-2, 1996
   o Global Telemedicine and Federal Technologies Symposium and Exhibition, Williamsburg, VA, July 8-10, 1996

4. STATUS OF RESPONSE TO ARMY IRB REGARDING MCG REIMBURSEMENT FOR COMPLICATIONS INVOLVING CIVILIAN PATIENTS--M. Stachura

5. UPDATE ON CLINICAL SUBCOMMITTEE ACTIVITIES--M. Stachura

   o Continued selection, consenting, etc. of civilian and military patients
   o Need for two lists by March 25
      o Progress during March
      o Problems encountered during March and plans for solving these problems
   o Availability of the three spreadsheets defining patient status*

6. UPDATE ON TECHNICAL SUBCOMMITTEE ACTIVITIES--M. Burrow

   o Current status of units in patient and hospital sites
      o Hardware status (Replacement of video cards, problems with stethoscope, replacement of touch-screen monitors, etc.)

- o Software status (Upgrades, bugs, etc.)
- Continued installation of units in military patient homes
- Status of EAMC communications link

7. **UPDATE ON OPERATIONS SUBCOMMITTEE ACTIVITIES--L. Adams**

- Status of Training Material preparation
- Status of Checklist preparation

8. **UPDATE ON EVALUATION SUBCOMMITTEE ACTIVITIES--K. Grisby**

- Discussion of Research Plan for the evaluation effort

9. **DISCUSSION OF PLANS FOR INVOLVEMENT IN NATIONAL FORUM '96--All**

- Plans for exhibit (Patient and hospital units connected together in booth for demonstrations, possible ISDN link to EAMC, VCR and tape display, large backdrop, enlarged photos on backdrop, furniture, etc. all delivered and setup on April 1)

- Plans for Poster Session

10. **DISCUSSION OF PLANS FOR PROPOSING FOLLOW-ON EFFORTS--All**

- If proposal is to be submitted to MATMO
  - Due date
  - What to propose
  - Who preparing/combining materials

- If proposal is to be submitted to other organizations
  - Due date
  - What to propose
  - Who preparing/combining materials

- Comments on possible industrial consortium for follow-on funding
  - Intel
  - Johnson & Johnson Medical
  - Healthcare Interchange
  - Jones Intercable
  - 3M
  - Dell/IBM
  - Cannon

11. **SOLICITATION FROM NATIONAL TELECOMMUNICATIONS INFORMATION ADMINISTRATION**--J. Toler

- o Proposals due April 5
- o Project period range from 9 to 24 months
- o Funds are from Demonstration ($750K max award), Access ($250K max award), and Planning ($100K max award) Grants
- o 50 percent matching funds required (NTIA will provide 50 percent)
- o One interest area is "telemedicine systems that extend medical expertise to underserved areas and/or into the home"

12. **COMMENTS ON TELE-HOME CARE CONFERENCE**--Conference Attendees

* Action Item from previous meeting.

Electronic House Call Project
Steering Committee Meeting
March 19, 1996
1:30 pm

The Steering Committee of the Electronic House Call Project met on Tuesday, March 19, 1996, via Video Teleconference between Medical College of Georgia and Georgia Institute of Technology.

Members Present	Institution
Mrs. Laura Adams	Medical College of Georgia
Mr. Mike Burrow	Georgia Institute of Technology
Dr. Kevin Grigsby	Medical College of Georgia
Mr. John Peifer	Georgia Institute of Technology
Dr. Dan Rahn	Medical College of Georgia
LTC Loretta Schlachta	Eisenhower Army Medical Center
Dr. Max Stachura	Medical College of Georgia
Mr. Jim Toler	Georgia Institute of Technology

Members Absent	Institution
Dr. Betsey Blakeslee	Eisenhower Army Medical Center
Mr. Jack Horner (rep. by Vince Colwell)	Eisenhower Army Medical Center
Dr. Jay Sanders (Ex-officio)	Medical College of Georgia
Dr. Dan Ward	Eisenhower Army Medical Center

Other Attendees: Mrs. Ann Brown, Recorder, Dr. John Searle, (MCG).

Welcome
Mr. Toler, Chairman, called the meeting to order and confirmed that everyone received the agenda.

Confirmation of Quorum
Mr. Toler asked Mrs. Brown to confirm that a quorum of members was present. She confirmed that the requirement of two members representing each institution was satisfied.

Approval of Minutes from March 11 Meeting
Mrs. Brown reported that several changes had been brought to her attention by members. She has made the changes and will redistribute the minutes.

Announcements
<u>Conferences</u>
Mr. Toler asked everyone to note upcoming telemedicine-related meetings listed on the Agenda. Ms. Schlachta reported that she and Mr. Burrow are both on the agenda at an upcoming conference and will coordinate their presentations.

Status of Report to Army IRB Regarding MCG Reimbursement for Complications Involving Civilian Patients

Dr. Stachura reported that he had received a copy of a letter from General Xenakis to Cmdr. Greenauer which supports a compromise to allow MCG patients to be connected. He has not received anything back from Cmdr. Greenauer. Ms. Schlachta indicated she spoke with Cmdr. Greenauer and he is awaiting *(title)* Vanderham's office to approve the changes. Cmdr. Greenauer is out this week.

Dr. Stachura indicated that this creates some problems with the March progress letter and the question remains of preparing a proposal for an extension of funding. Mr. Toler asked Dr. Stachura to clarify if this means we can proceed with Eisenhower patients. He responded that we can proceed with EAMC patients but have decided it is not wise to put units in homes of MCG patients. The homes could be cabled; however, and verbal instructions could be provided to patients. Ms. Schlachta reported that seven patients have consented to participate from EAMC.

Report of the Clinical Subcommittee

Dr. Rahn asked why not go ahead and install equipment in MCG patients' homes? Dr. Stachura explained that injury from having the equipment in the home could occur although the equipment would not be connected to the monitoring station or used for medical purposes. This would create a possible liability. Since the consent form has not been approved, we need to wait to put equipment in homes.

Ms. Schlachta asked if the specific protocols for each patient should be developed by hand or if these protocols would be incorporated with the software. Mr. Toler responded that it is not in the software at this point. Dr. Stachura explained that this would be part of the substance of the extension request. Ms. Schlachta asked how extensive the software would be as planned. Mr. Peifer stated it can be designed as it is being developed, and possibly by June some new information could be incorporated. Dr. Stachura asked about the funding for software development. Mr. Toler explained that the software group is funded through April. They will need to figure how long it will take to finish the clean-up of the system and then determine the priorities for additional development. Mr. Peifer and Ms. Schlachta will discuss this outside the meeting. It will involve clinical, evaluation, and operational decisions.

Dr. Stachura asked that information for inclusion in the March progress report be provided to him by Close of Business March 25.

Update of Technical Subcommittee Activities

Mr. Burrow reported that Engineers continue to work on the links and the ISDN connection from Mrs. Kohlmeyer's home to EAMC.

Dr. Searle reported that there has been some trouble with the link between EAMC and his Lab,

using two ISDN lines. Mr. Colwell stated that one line was being used for another purpose during the testing period. Dr. Searle also reported problems from Jones Intercable. Fiber has been installed and they are working on the problem. Mr. Burrow stated that the video cards are causing some of the problems.

Additional technical issues are: shipping, adjustments on the signal, and problems with the touch screen monitors. Dr. Searle reported that the picture on the new replacement monitor is fuzzier than the picture on the original monitor. The technical group will be sending some of the monitors back to the company, Elo. Dr. Searle reported that by the end of the week, Dr. Jackson's home and the Nursing Home will be ready to be installed. Also, two more EAMC patients are ready to be installed. A home visit will be needed for these patients.

Mr. Burrow asked if a target date could be set for installation of these additional units. Dr. Searle will call Mr. Hess to see when he can check on these homes. Ms. Schlachta suggested next week as a target for the installation. Otherwise, April will be here and we will have shown little progress for the month of March. The target connection date will be Wednesday, March 27. The homes will be visited this week and the equipment will be placed in the homes and Phase 1 training will be conducted. Next week, once the connection is established, Phase 2 training will occur.

Mr. Colwell reported that they will move EAMC's unit from the Center for Total Access into the Telemedicine Center. This will require a change on MCG's calling number.

Operations Subcommittee Report
Mrs. Adams reported that a draft Training Manual for patients and operators has been developed. She is asking the nurses, Wendy Andrews (MCG) and Jean Barnes (EAMC), to identify areas of improvement. Table of Contents for the manuals will be provided to the Steering Committee. The committee needs to know if EAMC has a vehicle that can be used to transport a unit. She also needs the names of people from EAMC who will participate in the technical support pool.

Update on Evaluation Subcommittee Activities
Dr. Grigsby distributed the Evaluation Subcommittee's evaluation plan. The committee believes the best way to proceed is with a formative and summative evaluation. There will be essential data to collect from all people involved in the project. Part of this is contingent on permission to move ahead. MCG is on hold with the Human Subjects Approvals. EAMC is able to move ahead. He stated that as we expand the software on the system, he would like to try to get this information if possible, as a log of what has happened. A list of data requirements was distributed. The committee realizes that all the data may not be available. He also reported that arrangements have been made for Dr. Bashshur and Mr. John McCarthy of the University of Michigan to work on this project. Mr. Toler asked if the Steering Committee needed to vote on

this. Dr. Grigsby replied that Steering Committee approval was not needed because Dr. Bashshur was specifically named in the grant, and Mr. McCarthy is the Biostatistician funded through MCG's budget. John Peifer and Dr. Grigsby will discuss research information to see what can be logged from patient contact.

Dr. Stachura asked if we should be interviewing nurses and patients. Dr. Grigsby stated that we need a functional unit first.

Update on Plans for Involvement in National Forum
Mr. Toler reported that those attending will discuss the poster and exhibit outside the meeting.

Discussion of Plans for Proposal for Follow-on Efforts
Dr. Stachura stated that we ought to be prepared for request for a rapid plan. Dr. Stachura will collect thoughts from Ms. Schlachta (EAMC) and Mr. Toler (GIT). Dr. Grigsby commented that it is important to determine that the Army will allow us to pursue other avenues of funding. Dr. Stachura asked what if we find out that the project is not going to be funded by the Army after June 30. Dr. Grigsby responded that he believes we must be released explicitly by the Army in order to take any of the materials from this project and continue to develop or use them. Mr. Colwell and Ms. Schlachta offered to clarify this with the Army.

Other Items
The ISDN link for the National Forum was discussed - there is concern about putting two systems "back to back". Mr. Toler feels it would be better to show a link to MCG. Either way this works out, there will be two systems to demonstrate.

The next meeting will be a VTC on Thursday, March 28, 1996 at 1:00 pm.

Action Items from the Meeting:

Dr. Stachura will continue to try to contact Cmdr. Greenauer.
Table of Contents for the manuals will be provided to the Steering Committee.
John Peifer and Dr. Grigsby will discuss research information/software.
Members attending the National Forum will discuss the poster/ exhibit.
Mr. Peifer and Ms. Schlachta will discuss software possibilities.

Respectfully Submitted,

Ann H. Brown, MHSA

3/21/96

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STEERING COMMITTEE MEETING

FOR THE

ELECTRONIC HOUSE CALL PROJECT

March 28, 1996
11:30 am - 12:30 pm
Video Teleconference

CALL TO ORDER AND WELCOME

1. **CONFIRMATION OF A QUORUM**--A. Brown

2. **ACCEPTANCE OF MINUTES OF MARCH 19, 1996 MEETING**--A. Brown

3. **ANNOUNCEMENTS**--J. Toler

   o **Telemedicine: New Technologies for Health Care**, MIT/Cambridge, MA, April 1-2, 1996
   o **National Forum 96: Global Telemedicine and its International Implications**, Tysons Corner, VA, April 2-4, 1996
   o **Telemedicine Successes: Audio Teleconference on Telemedicine**, with guest Dr. Ace Allen, editor of *Telemedicine Today*, hosted by J.R.B. Hutchinson, M.D., April 9, 1996, 11am
   o **Telemedicine 2000 Conference and Exhibition**, Chicago, IL, June 19-21, 1996
   o **Global Telemedicine and Federal Technologies Symposium and Exhibition**, Williamsburg, VA, July 8-10, 1996

4. **REVIEW OF PLANS FOR NEXT WEEK'S PARTICIPATION IN NATIONAL FORUM 96**--All

   o Exhibit of EHC systems
   o Booth staffing
   o Poster presentation
   o ISDN link
   o Panel presentation

5. **UPDATE ON ACTIVITIES OF THE CLINICAL SUBCOMMITTEE**--M. Stachura

   o Status of Army's response to IRB document submitted by MCG
   o Plans for further civilian patient identification
   o Plans for further military patient identification

6. **UPDATE ON ACTIVITIES OF THE TECHNICAL SUBCOMMITTEE--M. Burrow**

- o Review of the number of systems
  - o Currently exist? Patient site: ___ Hospital site: ___
  - o On order? Patient site: ___ Hospital site: ___
  - o Additional needed? Patient site: ___ Hospital site: ___
- o Current status of delivered systems
  - o Hardware status (video cards, upgraded stethoscope, touch-screen monitors, etc.)
  - o Software status (Upgraded version, known bugs, etc.)
  - o Status of MCG/EAMC ISDN link

7. **UPDATE ON ACTIVITIES OF THE OPERATIONS SUBCOMMITTEE--L. Adams**

8. **UPDATE ON ACTIVITIES OF THE EVALUATION SUBCOMMITTEE--K. Grisby**

9. **DISCUSSION OF PLANS FOR FOLLOW-ON EFFORTS--All**

- o Ideas for second-year efforts

- o If proposal is to be submitted to MATMO
  - o Due date
  - o What to propose
  - o Who preparing/combining materials

- o If proposal is to be submitted to other organizations
  - o Due date--ASAP
  - o What to propose
  - o Who preparing/combining materials

- o Comments on meetings held with potential consortium of industry sponsors
  - o Have met with
    - o Intel — Scott Darling, Director, ProShare Division, Hillsboro, OR
    - o J & J Medical, Inc. — Bruce Friedkin, Director, Measurement Technologies, Tampa, FL
    - o Healthcare Interchange — Art Stengal, Managing Director, St. Louis, MO
    - o Jones Intercable — Jim O'Brien, CEO, Denver, CO

- o 3M — Joe Donnelly
  Manager, Diagnostics Laboratory
  St. Paul, MN

o Within the next two/three weeks, will meet with
- o Dell/IBM
- o Cannon/Kodak

o Have discussed
- o Industry/university/military partnership with multi-year duration
- o Partnership meetings in which tele-home care needs are discussed and research agendas are defined
- o Industry donation of hardware and software
- o Industry funding for various research projects
- o State-of-the-art tele-home care display setup in the new GCATT building prior to the Olympics, and maintained for the duration of the partnership

Electronic House Call Project
Steering Committee Meeting
March 28, 1996
11:30 am

The Steering Committee of the Electronic House Call Project met on Thursday, March 28, 1996, via Video Teleconference between Medical College of Georgia and Georgia Institute of Technology.

Members Present	Institution
Mr. Mike Burrow	Georgia Institute of Technology
Dr. Kevin Grigsby	Medical College of Georgia
Mr. John Peifer	Georgia Institute of Technology
Dr. Dan Rahn	Medical College of Georgia
LTC Loretta Schlachta	Eisenhower Army Medical Center
Dr. Max Stachura	Medical College of Georgia
Mr. Jim Toler	Georgia Institute of Technology

Members Absent	Institution
Mrs. Laura Adams	Medical College of Georgia
Dr. Betsey Blakeslee	Eisenhower Army Medical Center
Mr. Jack Horner (rep. by Vince Colwell)	Eisenhower Army Medical Center
Dr. Jay Sanders (Ex-officio)	Medical College of Georgia
Dr. Dan Ward	Eisenhower Army Medical Center

Other Attendees: Mrs. Ann Brown, Recorder, Dr. John Searle, (MCG).

Welcome
Mr. Toler, Chairman, called the meeting to order and confirmed that everyone received the agenda.

Confirmation of Quorum
Mr. Toler asked Mrs. Brown to confirm that a quorum of members was present. She confirmed that when Mr. Colwell arrived, the requirement of two members representing each institution would be satisfied.

Approval of Minutes from March 19 Meeting
Mrs. Brown reported that minutes had been mailed out on Monday, March 25. Some members had not yet received them, so the approval of the minutes will be delayed until the next meeting.

Announcements
<u>Conferences</u>
Mr. Toler asked everyone to note upcoming telemedicine-related meetings listed on the Agenda.

Review of Plans for Next Week's Participation in National Forum 96
Mr. Toler explained that a patient site and hospital site would be transported to Washington for demonstrations. An 8x10 exhibit booth will have a backdrop with signs and enlarged photographs of the system. Mr. Barry Sudduth and Mr. Sam Panchal will drive there on Sunday. Mr. Burrow and Mr. Ed Carmichael, an ISDN consultant, will leave on Sunday. Mr. Andy Hopper will leave on Monday morning and Mr. Toler will leave Monday afternoon. They plan to set up the booth on Monday and will connect to Augusta. The exhibit time on Monday from 6-9 pm has been canceled, so the opening demonstration time is 7:30 Tuesday morning. Ms. Schlachta mentioned that Lt. Baker will be on duty at Eisenhower hospital 24 hours in case there is assistance he can offer. Mr. Colwell is going to Washington on Sunday and Ms. Schlachta, Dr. Stachura, and Dr. Grigsby will arrive on Monday evening.

The group discussed what type of link would best serve the demonstration purposes. They would be able to have more flexibility connecting to EAMC or MCG than to a patient. A patients' home would be difficult to schedule. Mr. Colwell stated that in connecting with patient #2, he has had barely audible audio sound and no video. It was decided that they would connect with Dr. Searle's lab at MCG.

Dr. Searle mentioned that he was confident that they will be able to make the connection. He is not sure if it will be able to extend on the RF line. He found an error on Jones Cable's part and they are trying to correct now. Mr. Toler asked if contacting the president of Jones Cable in Colorado would be helpful. It was agreed that this might be helpful.

Dr. Searle believes the Ro Street patient would work for a connection from Washington, D.C. He proposes to work toward connecting with patient #2 for a demonstration but believes the best choice patient is patient #1. Dr. Stachura asked if there was a question that we could connect from Washington, DC to MCG or EAMC. He believes the credibility would be higher if a home participates in the connection. That could be scheduled at the last possible minute.

Dr. Stachura reported that he is preparing slides for the panel presentation. He is to focus on general rather than technical aspects for his presentation in the panel titled "Telepresence."

Report of the Clinical Subcommittee
Dr. Stachura stated that the key item at hand is the IRB forms. This issue has been resolved. Although there were some final barriers, the credit goes to General Xenakis for using his influence to remove the barriers. We are continuing to recruit patients ad MCG and at EAMC. Mrs. Brown is providing a patient and provider status list each week.

Mr. Burrow reviewed the number of stations being prepared and where they would be placed. The technicians will place additional orders by April 15 for as much more equipment as funds
Electronic House Call Project

allow. Dr. Grigsby reminded the committee that the requirement is not have to have the units in 25 homes simultaneously. He suggests deploying 13 units in EAMC patient homes and then serially adding MCG patients as funding/equipment allows.

Dr. Stachura believes they will get a good idea of the possibility of continued funding at the Tyson's Corner meeting.

Dr. Stachura asked about the status of placement in the Nursing Home. Dr. Searle responded that it can be installed any time.

Update of Technical Subcommittee Activities
Mr. Burrow reported that they are buying video cards one at a time and they have enough for the patient homes. This should not delay the progress. Mr. Toler asked about the stethoscopes. Mr. Burrow responded that it is working well in the test system and will be able to be demonstrated. He further reported that they have not looked into the problem with some of the monitors looking fuzzy.

Status of Software - there have been some run time errors. An updated version of the software will be installed in all the systems. Dr. Searle asked if the system in his lab has a new display board. Mr. Burrow stated that he didn't think the lab nor the Ro St. site have the new boards. They will send another board from Ga. Tech.

Mr. Colwell offered his assistance on Monday is setting up the connection for the demonstration in Washington.

Operations Subcommittee Report
Mrs. Schlachta asked who was responsible for overseeing the process of installing the equipment. For example, she had a call from a patient who was concerned that the Cable company had missed their appointment. She would like to suggest that someone be designated as responsible for insuring the installations occur rapidly and smoothly. She also has concerns about the nurses' time being spent traveling to the patients homes several times and is not sure of the purpose of this. We are also far behind on the installation schedule for the project. Technical and installation progress needs to be a priority. Dr. Stachura suggested a checklist for patients so they will know what activities need to occur.

Mr. Toler asked the Operations Subcommittee to redefine oversight of the installation/training, specifically determining what visits are necessary for the nurse, and coming up with a checklist for the patients.

Update on Evaluation Subcommittee Activities
Dr. Grigsby reported that the IRB requirements have been met. The consent forms have been revised for the sixth time. Once the system is in the home being used, the evaluators are ready to

revised for the sixth time. Once the system is in the home being used, the evaluators are ready to

begin collecting data. He will discuss this with Dr. Bashshur next week.

Discussion of plans for Follow On Efforts
Mr. Toler mentioned his concern about having no gaps in funding because the personnel will be moved to different projects if no promise of additional funding is received. MCG is in the same situation. Cmdr. Greenauer knows this.

Ms. Schlachta indicated that she believes that those attending the forum will get a clear image after the face to face meeting with the Army officials. She believes there will be additional funds if the officials believe that the deliverables have been met.

Dr. Grigsby offered to take the lead in beginning to develop a proposal for MATMO if Ga. Tech will continue in the industry proceedings.

Mr. Toler mentioned that President Tedesco had worked with Johnson and Johnson on a partnership which might be combined with this project.

The meeting was adjourned with the loss of the connection at 12:30 pm.

Action Items from the Meeting:

Engineers will forward video boards to Dr. Searle for his lab and Rozella St. units.
Operations Subcommittee will review protocols/consider patient information checklist.

Respectfully Submitted,

Ann H. Brown, MHSA

4/10/96

AGENDA AGENDA AGENDA

STEERING COMMITTEE MEETING

FOR THE

ELECTRONIC HOUSE CALL PROJECT

April 22, 1996
1:30pm - 2:30 pm
Video Teleconference

CALL TO ORDER AND WELCOME

1. **CONFIRMATION OF A QUORUM**--D. Rayner

2. **ACCEPTANCE OF MINUTES OF MARCH 19 AND MARCH 28, 1996 MEETINGS**--D. Rayner

3. **ANNOUNCEMENTS**--J. Toler

   o Telemedicine 2000 Conference and Exhibition, Chicago, IL, June 19-21, 1996
   o Global Telemedicine and Federal Technologies Symposium and Exhibition, Williamsburg, VA, July 8-10, 1996

4. **REVIEW RESULTS OF THE APRIL 10, 1996 MEETING OF THE CLINICAL AND OPERATIONS SUBCOMMITTEES**--M. Stachura and L. Adams

   o Procedures for patient identification and consenting
   o EHC installation procedure

5. **REPORT OF THE TECHNICAL SUBCOMMITTEE**--M. Burrow

   o Status of efforts to get installed systems operating
      o Problems with network
      o Problems with cable
      o Problems with VTC
   c Status of efforts to arrange meeting in Augusta involving network person (R. Abler, Jones Intercable technical person, Intel ProShare person)
   o Status of installed systems
      o Software version
      o Video cards
   o Number of systems assembled and ready for installation

- o Number of systems on order
- o Maintenance procedure

6. **UPDATE ON ACTIVITIES OF THE EVALUATION SUBCOMMITTEE**--K. Grigsby

7. **DISCUSSION OF PLANS FOR FOLLOW-ON EFFORTS**--All

- o Strong inter-university collaboration formed by Presidents Clough and Tedesco, with both presidents assisting in efforts to secure industry funding
- o Draft proposal for formation of a university/industry partnership has been prepared and is being reviewed
- o Conversations have been held with Augusta and Atlanta VA Medical Centers regarding their involvement in the partnership

8. **UPDATE ON PLANS FOR TELEMEDICINE DEMOS DURING OLYMPIC GAMES**--J. Toler

- o ACOG has informed GBMC of their desire for telemedicine support at family hotel(s), airport, and Polyclinic at GIT
- o GBMC has asked GIT to look into possibilities at GIT Polyclinic
- o Polyclinic desires telemedicine involvement and may want to use separately-procured EHC-like systems
- o Discussions continue regarding which systems, where they are to be located, possible insertion of ARPA high-end technology, possibilities for revenue generation following the Olympics, etc.

9. **NEXT MEETING DATE/PLACE**

Electronic House Call Project
Steering Committee Meeting
April 22, 1996
1:30 pm

The Steering Committee of the Electronic House Call Project met on Monday, April 22, 1996, via Video Teleconference between Medical College of Georgia and Georgia Institute of Technology.

Members Present	Institution
Mrs. Laura Adams	Medical College of Georgia
Mr. Mike Burrow	Georgia Institute of Technology
Mr. Jack Horner	Eisenhower Army Medical Center
Mr. John Peifer	Georgia Institute of Technology
Ms. Loretta Schlachta	Eisenhower Army Medical Center
Dr. Max Stachura	Medical College of Georgia
Mr. Jim Toler	Georgia Institute of Technology
Dr. Dan Ward	Eisenhower Army Medical Center

Members Absent	Institution
Dr. Betsey Blakeslee	Eisenhower Army Medical Center
Dr. Kevin Grigsby	Medical College of Georgia
Dr. Dan Rahn	Medical College of Georgia
Dr. Jay Sanders (Ex-officio)	Medical College of Georgia

Other Attendees: Dr. John Searle, (MCG).

Welcome
Mr. Toler, Chairman, called the meeting to order and confirmed that everyone received the agenda.

Confirmation of Quorum
Mr. Toler confirmed that a quorum of members was present.

Approval of Minutes from March 19 and March 28 Meetings
Minutes of both meetings were approved.

Announcements
Conferences
Mr. Toler asked everyone to note upcoming telemedicine-related meetings listed on the Agenda.

Review Results of the April 10, 1996 Meeting of Clinical and Operations Subcommittees
The procedures for patient identification and consenting were discussed, as well as the EHC installation procedure. The suggestion was made to call the patients daily during the 10-12 day installation procedure to update them on installation and testing.

Dr. Stachura suggested that each institution consider a salary moratorium of employees who could not be effectively utilized but are currently paid by the cooperative agreement until Jones Cable problems are solved. Salary appropriations will be evaluated. Dr. Ward proposed addressing Jones Cable to contribute (match) cuts to keep the team together after the 6/30/96 end date. Dr. Stachura and Mr. Toler will discuss this at a later date.

Report of the Technical Subcommittee

Dr. Searle will let Harry Hess and George Paschal of Jones Cable know of the dates the test equipment is needed. He will meet with Intel and Ga Tech on Friday, 4/26. It was decided to suspend installations until existing systems are functional.

Mr. Horner stated that once the system was declared operational, Ft. Gordon no longer had a technical responsibility. This is tied to Federal government regulations.

Ms. Schlachta will contact Mr. Colwell to make sure he will follow up with changing IMUX settings.

Mr. Peifer reported that the new version of Ga Tech software will be better. The video cards are installed and 6 more units are ready to go. They have ordered 9 more units for a total of 25.

Dr. Stachura suggested that as the Technical Subcommittee works with Jones Intercable, there should be a daily summary prepared in order to document efforts made to resolve technical barriers. The Technical Subcommittee will accomplish this.

Discussion of Plans for Follow on Efforts

Mr. Toler reported that there has been a strong inter-university collaboration formed by Presidents Clough (GIT) and Tedesco (MCG), with both presidents assisting in efforts to secure industry funding. A draft proposal for formation of a university/industry partnership has been prepared and is being reviewed by Dr. Clough's office. Conversations have been held with Augusta and Atlanta VA Medical Centers regarding their involvement in the partnership.

There was discussion of Cmdr. Greenauer's position on funding for next year. The project ends on June 30, 1996 and it must continue to execute deliverables.

Federal Acquisitions - Page 15 of the Cooperative Agreement addresses intellectual property rights. Ms. Schlachta indicated she understood the Department of Defense's position with the EHC project was that the Department of Defense owned exclusive rights to all intellectual property derived from the project. Mr. Toler explained Ga.Tech's position; that for any agreement or grant, the institution retained rights. Dr. Stachura commented that he thought this was also true for MCG. The committee requested clarification of the statement of EHC declaration. MCG and GIT will check with their Legal and Property Rights offices.

Update on Plans for Telemedicine Demos During Olympic Games

In addition to the information listed on the agenda, Mr. Toler indicated that the Poly Clinic has seen the EHC project and some parts are suitable for delivery of health care during the games. He is awaiting a response from Georgia Baptist Medical Center to see if they wish to pursue this. Dr. Sanders is working with Mr. Horner to do a one time demonstration in conjunction with AT&T and EAMC.

Next Meeting Date/Place

The next meeting will be called at a later date.

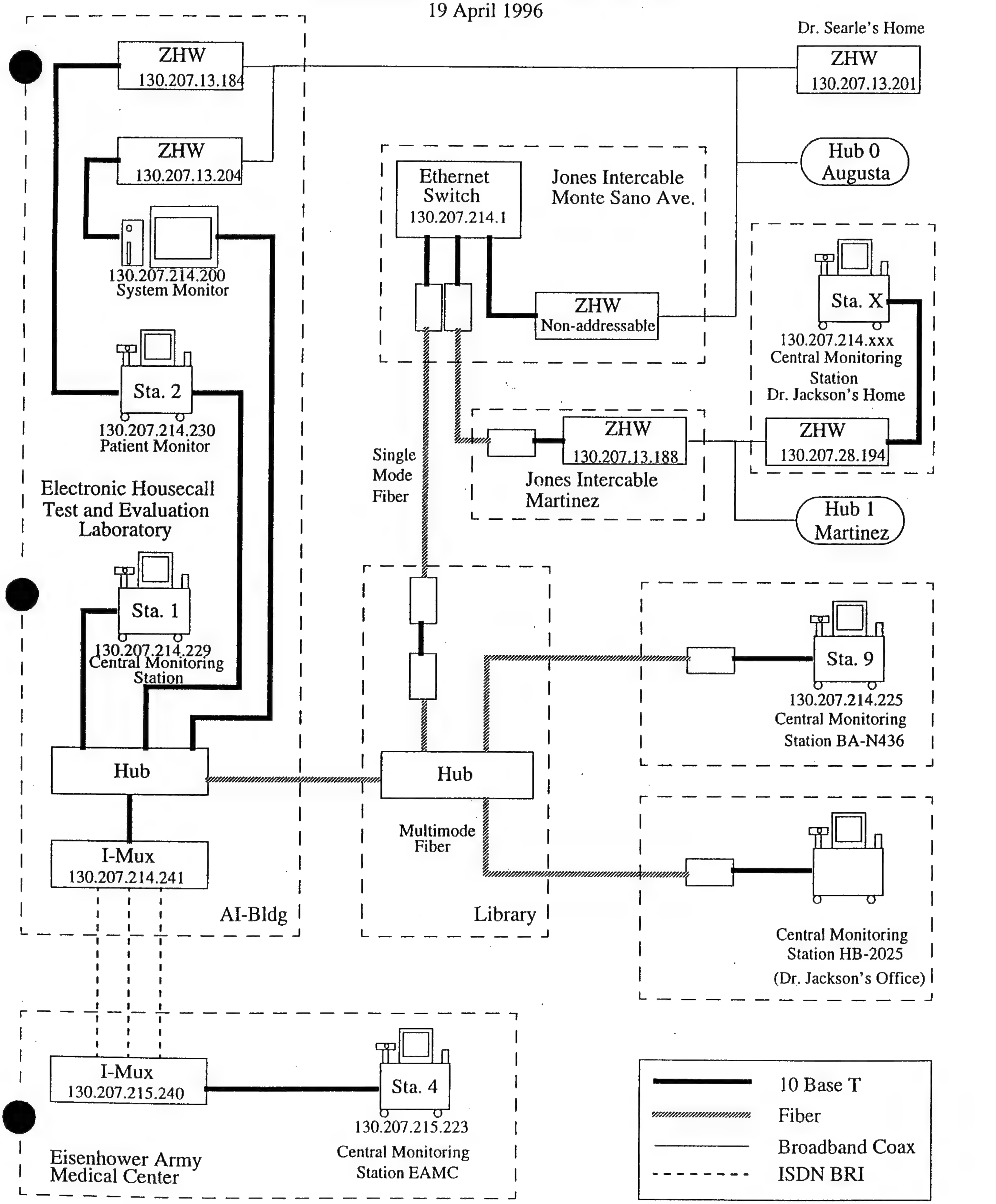
Respectfully Submitted,

Ann H. Brown, MHSA

5/15/96

Electronic Housecall Network

19 April 1996



AGENDA AGENDA AGENDA

STEERING COMMITTEE MEETING

FOR THE

ELECTRONIC HOUSE CALL PROJECT

May 15, 1996
3:00 pm - 4:30 pm
Telemedicine Center
Medical College of Georgia

CALL TO ORDER AND WELCOME

1. **CONFIRMATION OF A QUORUM**--A. Brown

2. **ACCEPTANCE OF MINUTES OF MARCH 22, 1996**--A. Brown

3. **ANNOUNCEMENTS**--J. Toler

   - **Telemedicine 2000 Conference and Exhibition**, Chicago, IL, June 19-21, 1996
   - **Global Telemedicine and Federal Technologies Symposium and Exhibition**, Williamsburg, VA, July 8-10, 1996

4. **REPORT OF THE TECHNICAL SUBCOMMITTEE**--M. Burrow

   - Review of factors causing inconsistent operation of the cable-based system
     - Up-channel noise from homes and external sources is primary culprit
     - Difficulty of cable modems and video teleconferencing software in operating in this noise environment
     - Resulting effect on system performance
   - Proposed options being pursued in parallel for resolving the problem
     - Work with cable modem manufacturers and JIC to reach a solution involving upgraded modems and cable connectivity
     - Work with technical representatives from Zenith and Intel to reach a solution involving improved performance of their products in a high-noise environment
     - Upgrade the priority of an ISDN capability, then develop and implement this capability
     - Investigate the performance of a different (ImageLink) video teleconferencing system in the existing noise environment
     - Do not pursue an analog video solution

5. **DISCUSSION OF PROJECT FUTURE**--Everyone

- o Time extension without additional funding
- o Time extension with additional funding
- o No time extension

6. **FINAL DECISIONS REGARDING TELEMEDICINE DEMONSTRATIONS DURING THE OLYMPICS**--J. Toler

7. **DATE FOR NEXT MEETING**

Electronic House Call Project
Steering Committee Meeting
May 15, 1996
3:00 pm

The Steering Committee of the Electronic House Call Project met on Wednesday, May 15, 1996, at Medical College of Georgia.

Members Present	**Institution**
Mrs. Laura Adams	Medical College of Georgia
Dr. Betsey Blakeslee	Eisenhower Army Medical Center
Mr. Mike Burrow	Georgia Institute of Technology
Dr. Kevin Grigsby	Medical College of Georgia
Mr. Jack Horner	Eisenhower Army Medical Center
Mr. John Peifer	Georgia Institute of Technology
Dr. Max Stachura	Medical College of Georgia
Mr. Jim Toler	Georgia Institute of Technology
Dr. Dan Ward	Eisenhower Army Medical Center

Members Absent	**Institution**
Dr. Dan Rahn	Medical College of Georgia
Dr. Jay Sanders (Ex-officio)	Medical College of Georgia
Ms. Loretta Schlachta	Eisenhower Army Medical Center

Other Attendees: Ms. Ann Brown, (MCG), Mr. Vince Colwell, (EAMC), Dr. John Searle, (MCG)

Welcome
Mr. Toler, Chairman, called the meeting to order and confirmed that everyone received the agenda.

Confirmation of Quorum
Mrs. Brown confirmed that a quorum of members was present.

Approval of Minutes from April 22 Meeting
The minutes were approved as distributed.

Announcements
Conferences
Mr. Toler asked everyone to note upcoming telemedicine-related meetings listed on the Agenda.

Report of the Technical Subcommittee

Mr. Toler informed the group that some members from each institution met last week in an informal meeting to discuss problems with technical aspects of the project and to discuss possibilities about continued funding of the project. He asked Mr. Burrow to review the technical problems discussed.

Mr. Burrow explained that two weeks ago representatives from Jones Intercable, Intel, a network expert from GIT, and researchers from GIT and MCG assembled to characterize the problems with the project. Jones' expert, Mr. Dave Feldman, gave an overview of the cable plant and how the modems work. He explained that the current status of the cable is as good as it will be. The problems come in with "ingress" noise in the cable. The Zenith modems which are being used are unable to handle the amount of noise generated. The Intel ProShare (software used for the project) algorithm does not handle errors and "lost packets," and the two things together cause problems. Modems capable of handling the noisy environment (able to do "frequency hopping") are being commercially produced now and will be available, but currently, our needs are ahead of the technology available. There is also a need for head-in equipment which will represent a large investment for Jones Intercable which will be necessary in order for the cable to be used with the new modems. An alternative approach is using ISDN lines rather than cable.

Dr. Searle added that measurements of the noise indicate that a great deal comes from South Augusta, and if it can be determined where the noise comes from, they may be able to filter the entry of the noise. Jones indicates their system is immune to noise from the community but not from homes. This will be a testbed, and we may be able to get priority from Jones on fixing this.

Dr. Blakeslee asked if we are trying to prove that the system works on Jones' network or if it works over any generic cable network. She would prefer to know that it works generically, rather than spending time to solve these problems which seem to be related specifically to Jones Intercable. Mr. Burrow stated he believes the problems experienced here are typical of any cable network since Jones is one of the more modern cable companies based on the layout of cable networks.

Mr. Toler added that he believes we are trying to demonstrate with a generic cable system, and we may need to see how generic Jones is. Mr. Peifer said we need a modified cable network to allow the testing with the new modem and Jones seems willing to provide that.

Mr. Colwell asked how it would be possible to get Intel ProShare to operate on cable. Mr. Burrow replied that they know it is made to run on ISDN. They have tested to find that ImageLink videoconferencing algorithms handle the noise better than ProShare. They are also working with Zenith people. This is all an effort to understand the best route to take with the connection end of the project.

Dr. Ward stated he sees Jones Intercable as benefitting from this more than any other institution, and they have been unwilling to give feedback when it has been needed. He feels they have used the institutions and they should be asked for funds to make it go in the right direction. He asked if anyone else feels this way.

Dr. Blakeslee informed the group that she knows Jones has had five Senior Executives leave in the last several months and they are in a major "crunch" mode. Jones has donated time and resources to this project. She has the following concerns: 1) She thinks we have to keep the objective of how patients and providers use the system. Is there another way to test the system? Perhaps Jones isn't the way. 2) Have we created anything new on the applications end? Is the complexity in the communications or the application? She thought we could take the existing applications and combine them to work together.

Mr. Toler asked if the three possible solutions which they wish to investigate simultaneously could be explained and then discussed. 1) ISDN single line solution, 2) Working with the Zenith and Intel representatives to try to realize increased performance of their products, and 3) Imagelink to see if it would work with the current system.

Mr. Peifer explained that he believes ISDN offers a good option and the same system function. They have modified the software in the lab, and must resolve a file transfer problem. This would allow the clinical work to continue to homes if it is decided to order the lines and to cover the cost of doing so. Mr. Burrow explained (2), saying they have identified a technical contact at Zenith and are setting up a four way audio conference to address problems. They are seeking a technical contact for Intel and plan to suggest that they come to Augusta to run the tests planned.

Dr. Stachura made the motion the Steering Committee approve the three avenues to be pursued in parallel so we can find out what options are best for the project. Mr. Horner asked if there was any time frame within which assurance of a viable approach would be available. Mr. Peifer responded that by the end of next week they would have hooked up with EAMC to test using ISDN lines and would know if that option would work well enough.

Dr. Blakeslee asked if there was an additional cost associated with exploration. Mr. Toler stated the group was not approving any additional costs at this time.

Mr. Colwell informed the group that he was not part of the Technical Subcommittee's decision to recommend these three avenues.

Mr. Burrow stated that the recommendations were made by Georgia Tech based on problems which have been seen by them in the interest of investigating the problems as soon as possible. He suggested if Mr. Colwell has recommendations for additional avenues that the Technical Subcommittee discuss it. The Subcommittee will look at the three approved.

The motion was made that other options will also be pursued. The motion passed.

Discussion of Project Future

Mr. Toler reported that the group meeting last week had discussed some options for continued work on the project. Dr. Stachura stated that Dr. Grigsby had prepared a document for review. He reviewed the document and pointed out that the intent was to request an extension of the project through September 30, 1996. He pointed out that the dollars expended up until now have spared funds that could be carried over (Federal dollars) and that $335K remained, assuming that the DOD provides the promised funds. A quick accounting of these funds indicates that $110K will be available to implement technical aspects that may be needed. Mrs. Adams stated that $20K has been protected for line costs for EAMC's telemedicine system. Dr. Stachura asked that the group forward comments to Dr. Grigsby by Monday, May 20.

Dr. Blakeslee asked if AND funds will be available as originally planned. Dr. Stachura said it may be possible to redirect funds back to that area if a task is identified. She does not remember the conversation this way and assumed the funds would be available. Dr. Stachura noted that it would be a Steering Committee decision to decide how to spend the remaining funds.
Dr. Blakeslee stated her comments on the proposal were that she was hoping for more specificity in how the group will go forward rather than in what has already been done. That information will be needed in order to decide about continuation of funding.

The committee adjourned the meeting at 4:00 pm

Next Meeting Date/Place

The next meeting will be held next Wednesday at 10:00 am.

Respectfully Submitted,

Ann H. Brown, MHSA

5/21/96

5/15/96

ELECTRONIC HOUSE CALL PROJECT EXTENSION PROPOSAL ("A Dual Use Telecommunications System for Delivering Medical Care")

Funding period:	6/30/95 - 7/31/96	
Funding sources:	Georgia Research Alliance	$950,000
	MCG Hospital and Clinics	$250,000
	US Army Medical Research Acquisition Activity (USAMRAA)	$916,687
	Total Award (cash)	$1,833,374
	Jones Intercable In-Kind contribution	$250,000
Proposed extension:	through 9/30/96	

Project synopsis: An academic/military consortium comprised of the Medical College of Georgia (MCG) Telemedicine Center, the Bioengineering Center at Georgia Institute of Technology (GIT), and the Eisenhower Army Medical Center at Fort Gordon was formed. Four tasks were to be performed during the first year:

1. Link EAMC to the telemedicine portion of the fiber-optic based Georgia Statewide Academic and Medical System (GSAMS) network;

2. Implement a cable-based "proof-of-concept" telemedicine system for delivering medical care to the homes of selected patients in Augusta and Fort Gordon, GA and to patients at a skilled nursing facility in Augusta, GA;

3. Develop and present to a Washington, DC audience, a kiosk-based demonstration unit that depicts the extensive dual-use capabilities of telemedicine; and

4. Extend the distribution of Georgia's statewide telemedicine system by adding PC-base telconferencing systems and still-image phone systems.

Since the initiation of the Electronic House Call project, significant progress has been made with each task. Specifically:

- Task 1: presently underway. Renovation of the telemedicine room at EAMC is required for the installation of the equipment. Renovations are in progress. The completion of the renovation by EAMC by the "room ready" date projection will allow for installation and validation of the equipment by 6/30/96.

- Task 2: Well underway. Human Assurances requirements have been met and the projects have been approved for by the Human Assurances Committees at MCG, EAMC, and at Ft. Detrick. Issues related to the possibility of needing FDA clearances have also been completed. Equipment has been purchased and deployed at the homes of several EAMC and MCG patients, and at both MCG Hospital and EAMC. It is important to note that this project is on the cutting edge of technology. The innovative nature of the project, as well as the stipulated conditions and time constraints have required several interim steps and/or adjustments:

- As required in the Cooperative Agreement, COTS (current off the shelf) technology was evaluated and utilized to the greatest extent possible. Issues of compatibility were anticipated, but were thought to be of less consequence than the design and development of all technology de novo.

- The cable television infrastructure has never been utilized for two way transmission of information that is at this level (2-way audiovisual integrated with medical instruments). Each instrument had to be validated for use in a system of this type.
- The existing cable TV infrastructure has been utilized, although ISDN linkage was also necessary to support the EAMC sites.
- Custom software to integrate the functioning of the home-base units had to be developed "from scratch". This included the development of a non-keyboard driven graphical user interface.

Approximately 25 "units" including equipment necessary to support two-way audiovisual communication and integrated medical instrumentation have been assembled. Deployment within a nursing home is imminent. Software has been developed , installed, and upgraded. In spite of the work that has been done to date, reliable communication has not yet been established, even though equipment is installed and patients have consented to its use. Scientific rigor requires that the system operate with an acceptable level of reliability before validation can occur. Likewise, it would be clinically inappropriate to use the system for patient care until its validity and reliability were established. For this reason, the formal evaluation of service delivery has not yet begun, as the system is not really a working "system" until the connection can be established reliably. The preliminary work for evaluation of the project is well underway.

- Task 3 was completed through the production of a professional quality videotape that offers a demonstration of the Electronic House Call system. This videotape was shown April 2-4 in Tyson's Corners, VA and was accompanied by a live demonstration of the Electronic House Call at "Global Telemedicine II", which was sponsored by the Department of Defense. A link between a remote and hub site were demonstrated "on-site" and a link from Virginia to a patient's home in Augusta was accomplished.

- As each of the home based units and hub units is configured around PC-based teleconferencing systems that utilize ProShare software, Task 4 is well underway. MCG Information Services Division (ISD) has been involved in preliminary discussions related to the extension of the Electronic House Call to PC-based, desktop applications. EAMC, MCG, and GIT have been exploring the various commercially available desktop conferencing products that are currently available. The Telepsychiatry Project at the MCG Telemedicine Center is exploring the use of PC-based videoconferencing. The Department of Pediatrics and Surgery at MCG are in the beginning stages of implementing PC-based systems as well.

Rationale: In order to successfully complete the project, an extension is requested, during which time the following will take place:

1. Completion of linking EAMC to GSAMS, if room ready dates are met.

2. Continuing to work towards establishing reliable telecommunications linkages for implementation of the Electronic House Call system. This includes the investigation of using ISDN technology or wireless technology, if the cable-based telecommunication infrastructure is unable to support reliable transmission of information. Further, critical evaluation of the system (no matter which telecommunications infrastructure is used) will also take place.

3. Extension of the system through the use of a distributed network of PC-based teleconferencing systems will continue. This will focus upon the use of various low-cost, commercially available telemedicine technology.

4. A complete report from the Consortium members will be completed. Finally, steering committee approval of that report will also be obtained.

AGENDA AGENDA AGENDA

STEERING COMMITTEE MEETING

FOR THE

ELECTRONIC HOUSE CALL PROJECT

May 22, 1996
10:00 am - 12 N
Telemedicine Center
Medical College of Georgia

CALL TO ORDER AND WELCOME.

1. **CONFIRMATION OF A QUORUM**--A. Brown

2. **ACCEPTANCE OF MINUTES OF MAY 15, 1996 MEETINGS**--A. Brown

3. **ANNOUNCEMENTS**--J. Toler

   - **Telemedicine 2000 Conference and Exhibition**, Chicago, IL, June 19-21, 1996
   - **Medicine 2001: New Technologies, New Realities, New Communities**, Montreal, Canada, June 19-23, 1996
   - **Global Telemedicine and Federal Technologies Symposium and Exhibition**, Williamsburg, VA, July 8-10, 1996

4. **COURSE OF ACTION FOR TCI FUNDING**--J. Toler and M. Stachura

5. **COURSE OF ACTION FOR NO-COST TIME EXTENSION**--J. Toler and M. Stachura

6. **UPDATE ON ACTIVITIES OF THE TECHNICAL SUBCOMMITTEE**--M. Burrow

   - Cable Solution
     - System improvements by JIC
     - Inputs by Zenith and Intel
     - Current operational status
   - ISDN Solution
     - Modification of EHC units
     - Testing efforts
     - Current operational status

7. **UPDATE ON TELEMEDICINE ACTIVITIES DURING THE OLYMPIC GAMES**--J. Toler

8. **NEXT MEETING DATE/TIME/PLACE**--All

ANNOUNCEMENT--J. Toler

Electronic House Call Project
Steering Committee Meeting
May 22, 1996
10:00 am

The Steering Committee of the Electronic House Call Project met on Wednesday, May 22, 1996, at Medical College of Georgia.

Members Present	Institution
Mrs. Laura Adams	Medical College of Georgia
Dr. Betsey Blakeslee	Eisenhower Army Medical Center
Mr. Mike Burrow	Georgia Institute of Technology
Dr. Kevin Grigsby	Medical College of Georgia
Mr. Jack Horner	Eisenhower Army Medical Center
Mr. John Peifer	Georgia Institute of Technology
Ms. Loretta Schlachta	Eisenhower Army Medical Center
Dr. Max Stachura	Medical College of Georgia
Mr. Jim Toler	Georgia Institute of Technology

Members Absent	Institution
Dr. Dan Rahn	Medical College of Georgia
Dr. Jay Sanders (Ex-officio)	Medical College of Georgia
Dr. Dan Ward	Eisenhower Army Medical Center

Other Attendees: Ms. Ann Brown, (MCG), Dr. John Searle, (MCG)

Welcome
Mr. Toler, Chairman, called the meeting to order and confirmed that everyone received the agenda.

Confirmation of Quorum
Mrs. Brown confirmed that a quorum of members was present.

Approval of Minutes from May 15 Meeting
Mrs. Brown reported she had received several changes to the minutes. She suggested that the changes be made and the minutes approved at the next meeting.

Announcements
Conferences
Mr. Toler asked everyone to note upcoming telemedicine-related meetings listed on the Agenda.

Dr. Stachura asked that the order of the agenda be changed to address item 6 before 4 and 5.

Update on Activities of the Technical Subcommittee
Mr. Burrow explained that the Technical Subcommittee had a telephone conference meeting

during which they discussed the options currently being pursued. They asked for alternate approaches and decided to proceed with the cable approach and the ISDN solution. There is interest in pursuing the RF (wireless) solution. They have ordered equipment to pursue this method, keeping the cable and ISDN methods as priorities. Jones Intercable is in the process of identifying sources of noise. They have identified "breaks" in the system that allow noise to enter and have boosted the return path signal. Testing has been done using software programs which can send packets and look for them to return. Before the improvements, there was a 3-5% rate of non-returned signals and now it has been reduced to .1-.05%, a substantial improvement. They need to know if Intel ProShare will work with this. Dr. Searle reported that Wendy Andrews, the nurse, had a conference with the Ro St. home and was successful for a 20 minute conference. She has another scheduled for today. He reported that they have connected with all 4 sites and two of the four had no deficiencies, while the other two had a few problems. They felt this was an acceptable level of performance and will continue to look at this. He feels they have made progress with the performance.

Mr. Burrow stated he doesn't think they have tried the system over a long enough period of time to say if it is reliable enough.

Ms. Schlachta asked what the criterion is for being reliable. Dr. Searle replied that it is the level of performance of the connection and the key is how much video comes back. Mr. Burrow stated the need to test with each home during the remainder of this week.

The discussion about milestones and testing continued.

Dr. Grigsby asked if the working system would be considered valid under the circumstance of .1% or less signal loss. He also suggested establishing reliability by scheduling a number of connections (perhaps 100) over a week's time. If the result is a valid connection 90 out of the 100 times, this would establish a success rate, at which time the systems can be turned over to the clinicians with their reliability established.

Mr. Burrow asked over what period we wanted to do this.

Dr. Stachura stated there were two parts to the clinical needs. The clinical groups can be discussing the clinical aspects of serving the current four patients, and then a week from Monday (assuming the testing is completed by that time and reliability established,) be ready with the clinical protocols. The second question is the installation into more homes. The technical Sub-committee needs to decide if this is ready.

Mr. Burrow stated they will work on calling the four connected homes and can report on the success rate at next week's meeting.

Ms. Schlachta offered for Jean Barnes, the EAMC nurse, to make half of the test calls from EAMC. She will need to know the length and number of calls to make.

The question arose if there would be a different success rate from EAMC based on the fact that the ISDN line connects EAMC to Jones Cable.

Dr. Grigsby asked what would be an acceptable loss. Dr. Searle stated approximately .5%, but this will be discussed by the Committee.

Mr. Toler asked Mr. Peifer to present the software changes. He stated ProShare can switch between the network or over ISDN. A hardware board must be added. They are changing the software to go back to use ProShare's data path with ISDN and must identify problems with the data path. They have discovered that when data is sent across the path, it causes a problem if another measurement is sent soon afterwards. They must put in protections around the areas to block the data channel until the first goes through. ProShare has not provided solutions, but have given other examples of uses for data paths. They have performed 72 error-free transfers by setting the software to wait until the data from the first measurement passes through the data channel before another is released.

Dr. Blakeslee asked if this affects the clinical use and if there is a time difference noticeable to the patients. Mr. Peifer responded that it doesn't take any longer. This change is transparent to the patient.

Dr. Grigsby asked what will happen if the patient does not wait to send measurement results.

Mr. Peifer stated it would be configured to tell the patient to wait until the first measurement is taken and sent before sending any more.

Ms. Schlachta asked the question "Is looking into ISDN being done because of the cable delays? If the cable is providing good results, do we need to do the ISDN?

John Peifer recommended continuing with both cable and ISDN.

Mr. Burrow stated he fears the cable quality might not be consistent. He favors testing ISDN and cable connections.

Mr. Horner told the group he was passing along information from Ft. Detrick and that they were only looking for the four "deliverables", which includes a cable based system, but not ISDN.

Dr. Stachura asked if there were other questions on the technical report.

Dr. Grigsby asked if the ISDN has application to the desktop telemedicine solution.

Mr. Peifer replied that it does have a tie-in to GSAMS and is an excellent solution for any physician's office to tie into the GSAMS system by purchasing a Pentium computer and an ISDN line.

Ms. Schlachta asked if the ISDN solution is the best for the desktop or if it going to be pursued because it is familiar to us. There may be other solutions.

Dr. Stachura stated that two meetings ago the group discussed deliverables. In the two weeks it has been determined that we will not deliver on June 30. There will be no solution without an extension. We need to talk about new issues and come up with an action plan.

Dr. Blakeslee stated she agrees with this but agrees with Ms. Schlachta in that she doesn't want to study just ISDN for the desktop solution.

Course of Action for No-Cost Time Extension

Mr. Toler told the group he has drafted a document to begin the process for a request for a no-cost time extension. This means no additional cost to the sponsor than what has originally been promised. The process has (in the past) involved the Steering Committee drafting a letter to the contracting office (MCG) requesting an extension at no cost, giving a new termination date. An explanation of why a time extension is being requested is included. This goes to the sponsoring agency who turns it over to those monitoring the project. A decision is made by technical and clinical people on the project and goes back down to the people doing the work. He stated he does not know any reason we would deviate from such a process for this situation. He believes the key is to get the request in so the process can be initiated. If we don't get the process started, we will be in a time gap in between termination of effort and the response to the request for the extension.

Dr. Blakeslee stated she believes this is logical and asked what the nature of the request is.

Mr. Toler replied that he has drafted a letter in response to Dr. Grigsby's proposal asking for a three month extension with no additional funds.

Dr. Blakeslee stated she would need a proposal for exactly what will be done in the extra three months along with a time line.

Dr. Stachura replied that before this week, a time line could not have been created for this project with any reliability. Now that the testing at one level is planned for Thursday and Friday and at another level for next week, some projections are possible.

Dr. Stachura stated the group needs to decide if cable will be used with ISDN as a back up or both will be tested simultaneously, due to the added value of testing with ISDN.

Ms. Schlachta asked if the objective is still to install in 25 homes.

Dr. Stachura asked if testing the ISDN connection is not part of the deliverable request, does this mean we will have no EAMC homes since EAMC is connected via ISDN lines?

Ms. Schlachta stated she does not think that it means no EAMC homes.

Dr. Stachura indicated he believes there is a greater value to be able to compare the use of ISDN and cable.

Dr. Blakeslee stated she would have to talk Fort Detrick into extending the contract. She stated she would like to see the cable system with the enhanced modems incorporated when they become available. She has a concern of reliability stakes and percentages.

Mr. Toler asked if the milestone chart could be completed at today's meeting.

Ms. Schlachta suggested that the technical people form a draft and everyone else incorporate their subcommittee's information into it.

Dr. Stachura asked Dr. Blakeslee to expand on her statement that Ft. Detrick has no intention of continuing to fund the project.

She responded that Cmdr. Greenauer had stated to her that unless they have specific actions for the project, he has no interest in continuing it. She stated this reflects badly on the Center for Total Access, and Cmdr. Greenauer wants her to provide a plan for next year's funding. If he asked her if she wants MCG or GIT as part of the plan for next year, she would say "not at this point." She stated he would also want to know exactly how the remaining funds would be spent.

Ms. Schlachta stated that the researchers at Ft. Detrick will look at the deliverables and see just three or four homes hooked up and a video which has been produced for $950,000.

Ms. Adams stated that in order for the plan to be made on expending the remaining funds, she needs to know what the course of action will be. For example, if ISDN is selected, line and installation costs need to be included.

Mr. Horner stated that if submitting a detailed budget, he believes the officials would look unfavorably on a lot of ISDN expenditures since that is not explicitly asked for in the deliverables listing.

Dr. Blakeslee asked that clinical, operational, and evaluation time lines be included in addition to the technical piece.

Ms. Adams responded that these would be done by each Subcommittee.

Dr. Grigsby moved that the group prepare a revised time line and ask for a 90 day extension to terminate on September 30.

Dr. Blakeslee asked about the new cable modems.

Dr. Stachura stated he does not believe the project is dependent on the new modems to be successful at this point and they probably would not be needed.

Ms. Adams responded that since the Technical Subcommittee has shown that the cable works as it is, there would be no reason to purchase and use the new modems.

Mr. Toler asked Mr. Burrow when the Technical subcommittee could have their time line completed. He stated by this Friday.

Dr. Blakeslee reminded the group that the time for home installation is important to include.

Ms. Schlachta stated that before there was leisure time built in to do a few per week, but now she would suggest having a crew to do many in one week.

There are currently 20 units for homes and an additional 5 on order. Mr. Horner asked if there is any way in advance of installing the equipment to see if the cable will work well from a home.

Dr. Searle replied that there is, but that a testing mode which will take a finite time period needs to be built into each installation.

Dr. Blakeslee stated she would like to get the time lines and sit down to put them all together.

Ms. Schlachta reminded the group that it must commit to a certain evaluation period and need a clear time line for this.

Dr. Stachura suggested that the time line from the Technical Subcommittee be sent on Friday and to take the weekend for the others to submit time lines. By Tuesday they will be merged into a chart.

Ms. Adams again asked, “What is the course of action?”

Mr. Toler stated that ISDN is being downplayed because of the now viable cable connection.

Dr. Stachura expressed his concern that Ft. Detrick has not communicated with him directly since the February report was submitted and that only a verbal approval of the change in PI from Dr. Sanders to him has been received. He would feel more comfortable with something in writing and in communicating directly with Cmdr. Greenauer. He further stated that he hears the Department of Defense side of the partnership discussing the option to move ahead with the project without the other two sides of the current triangle.

Mr. Toler stated that the other side to this issue is an option as well.

Course of Action for TCI Funding

Mr. Toler explained that the original proposal included three institutions and Silicon Graphics, Andres Tech, and AND Interactive. The activity for AND was to develop the patient interface. A consultant budget category of $25K each from GIT and MCG was listed for AND Interactive. The February minutes show these funds were allocated to pay for EAMC's nurse and for GIT to hire Mike Sinclair's group to complete the patient interface portion of the project. A cable company called TCI Health Systems has interest in the content from the health related view. They have indicated a willingness to have the EHC in the form of an application. One possible course of action if the group wants to fund them is to obtain a statement of what we want to fund them for. It should include a statement of what we can expect from them with time lines, etc.

Dr. Blakeslee stated that we need specifics from TCI. Only now are we at a point of being able to look at something real. She wants to make sure when they implement their system at Ft. Gordon that it will include EHC as the whole system. She believes this is a good opportunity. In order to match the EHC with TCI's interface, some work will have to be done on the software interface. Essentially AND was going to provide the ability to interface with other systems.

Dr. Stachura stated this was a little different than the presentation at Denver. He has not heard an "offer" until now.

Ms. Schlachta suggested giving a demonstration of the system.

Dr. Grigsby asked if this could be put into the form of a motion for the Steering Committee to discuss. His concern is whether this enhances any of the four items.

Mr. Burrow asked if the Committee could move that the $50K be set aside and request a statement of work and deliverables, etc. from TCI.

Dr. Blakeslee stated that AND Interactive will be able to give us a series of tasks that they will accomplish.

Dr. Stachura stated he knows we cannot commit MCG to anything at our level. He suggested Dr. Blakeslee check with the DOD about making a commitment to an outside company.

Dr. Blakeslee stated she had spoken with Dr. Tedesco about this project.

Dr. Grigsby asked to table the discussion now and come with an action item at the next meeting. The Steering Committee will need to hear this as a motion in order to act on the disbursement of funds.

Mrs. Adams confirmed that we have the ability to redirect funds at the approval of the project officer.

Dr. Stachura asked what is the group's relationship with Jones Intercable and if it will affect any agreement with TCI.

Dr. Blakeslee stated there are two sides, cable and content, and the content is more important. Therefore, she does not think it will affect the relationship with Jones Intercable.

Update on Telemedicine Activities During the Olympic Games

Mr. Toler stated that four demonstrations are planned by AT&T, Kodak, Panasonic, Emory, and Ga. Baptist Hospital.

Announcement

Mr. Toler announced that he will retire from Georgia Tech at the end of June and the Committee will need to think about a new chairman.

The meeting was adjourned at noon.

Respectfully Submitted,

Ann H. Brown, MHSA

7/1/96

AGENDA AGENDA AGENDA

STEERING COMMITTEE MEETING

FOR THE

ELECTRONIC HOUSE CALL PROJECT

June 12, 1996
10:00 am - 12 N
Telemedicine Center
Medical College of Georgia

CALL TO ORDER AND WELCOME

1. **CONFIRMATION OF A QUORUM**--P. Edwards

2. **ACCEPTANCE OF MINUTES OF MAY 22, 1996 MEETINGS**--P. Edwards

3. **ANNOUNCEMENTS**--J. Toler

   - o <u>Telemedicine 2000 Conference and Exhibition</u>, Chicago, IL, June 19-21, 1996
   - o <u>Medicine 2001: New Technologies, New Realities, New Communities</u>, Montreal, Canada, June 19-23, 1996
   - o <u>Global Telemedicine and Federal Technologies Symposium and Exhibition</u>, Williamsburg, VA, July 8-10, 1996
   - o **The Information Connection: Emerging Technologies Linking Patients and Providers**, Burlington, VT, February 5-7, 1997

4. **STATUS OF THE REQUEST FOR A NO-COST TIME EXTENSION**--M. Stachura

5. **REPORT ON ACTIVITIES OF THE CLINICAL SUBCOMMITTEE**--M. Stachura

6. **REPORT ON ACTIVITIES OF THE TECHNICAL SUBCOMMITTEE**--M. Burrow

   - o Results of system testing
   - o Operational changes at GIT due to the Olympics

7. **REPORT ON ACTIVITIES OF THE EVALUATION SUBCOMMITTEE**--K. Grisby

8. **REPORT ON ACTIVITIES OF THE OPERATIONS SUBCOMMITTEE**--L. Adams

9. **BITC MOVE TO NEW GCATT BUILDING**--J. Toler

10. **NEXT MEETING DATE/TIME/PLACE**--All

Electronic House Call Project
Steering Committee Meeting
June 12, 1996
10:30 am

The Steering Committee of the Electronic House Call Project met on Wednesday, June 12, 1996, at Medical College of Georgia.

Members Present	**Institution**
Mrs. Laura Adams	Medical College of Georgia
Mr. Mike Burrow (via phone)	Georgia Institute of Technology
Mr. Jack Horner (via phone)	Eisenhower Army Medical Center
Mr. John Peifer	Georgia Institute of Technology
Dr. Max Stachura	Medical College of Georgia
Mr. Jim Toler	Georgia Institute of Technology

Members Absent	**Institution**
Dr. Betsey Blakeslee	Eisenhower Army Medical Center
Dr. Kevin Grigsby	Medical College of Georgia
Dr. Dan Rahn	Medical College of Georgia
Dr. Jay Sanders (Ex-officio)	Medical College of Georgia
Ms. Loretta Schlachta	Eisenhower Army Medical Center
Dr. Dan Ward	Eisenhower Army Medical Center

Other Attendees: Ms. Ann Brown, (MCG), Ms. Jean Barnes, (Eisenhower) Dr. John Searle, (MCG), Ms. Patti Edwards, (MCG)

Welcome
Mr. Toler, Chairman, called the meeting to order and confirmed that everyone received the agenda. The group agreed to modify the order of the agenda to address items 1 and 2 at a later time when all expected members had arrived.

Confirmation of Quorum
Confirmation of a quorum was delayed until all expected members had arrived.

Approval of Minutes from May 22 Meeting
Approval of the minutes from the May 22 meeting was delayed until enough members had arrived. Due to extensive reports from the subcommittees, the approval of the minutes from May 22 was postponed until the next meeting.

Announcements
Conferences
Mr. Toler asked everyone to note upcoming telemedicine-related meetings listed on the Agenda.

Status of Request for a No-Cost Time Extension

Dr. Stachura gave the status report for the no-cost time extension. Dr. Stachura drafted a letter outlining the need for the extension. He attached a Gantt Chart which included all subcommittee activities through September 30, 1996, per Dr. Blakeslee's request. A rough draft was sent to Mr. Jim Toler and Mr. Jack Horner for review. Minor changes were suggested and incorporated. Mr. Horner has briefed Cmdr. Greenauer on the content of the letter. A final draft of the letter was sent to Dr. Russell Claybrook (Grants and Contracts), who requested several modifications as follows: 1) the change from a three month to a two month extension in respect to the termination date of the original agreement, 2) Dr. Claybrook's signature block should be added, 3) a courtesy-copy notation should be included with all Steering Committee members' names and titles. Dr. Stachura made the motion to officially send the letter with the modifications requested by Dr. Claybrook. Mr. Peifer seconded the motion. With the quorum of members now present, all members voted and the motion was carried.

Recorder

Mr. Toler explained that since the Committee voted on Mrs. Ann Brown as recorder, a change in recorder is a Committee action and therefore the committee must vote. Dr. Stachura made the motion for Mrs. Patti Edwards to become the new recorder; Ms. Adams seconded the motion. All members voted and the motion was carried.

Update on Activities of the Clinical Subcommittee

Dr. Stachura stated that all 25 systems and the nursing home need to be operational by July 31, 1996, to allow enough time for data collection. Four systems are already on line. Dr. John Searle is working with Jones Cable on ten more systems. The Clinical Subcommittee met on June 11 and discussed data collection. The committee realizes there are two separate institutions involved which will make two separate charting mechanisms. He would like to establish a common set of data to collect for each patient encounter.

Mrs. Brown, Mrs. Edwards, and Dr. Stachura will create a form to be used by each nurse at each visit. For each connection, technical information on the quality, length, and type of connection will be recorded.

The Technical Subcommittee will work on this with the Clinical Subcommittee. Mr. Peifer will pass on the information of what is already captured in the database to see if any of this information can be included in the database. Mr. Peifer stated some of the information is already a part of the database. Dr. Stachura stated he is looking for a minimal document to capture this information.

Dr. Grigsby made the recommendation at a previous meeting about confirmation to have scheduled in-home visits for validation of the system. The current plan is to have 3 home visits per patient to confirm validity. This would provide a total number of 75 observations.

Mr. Toler asked what would be collected on nursing home patients. Dr. Stachura replied that 3 visits to the nursing home (not 3 per patient) would be considered. He also stated that all components of the system would be operated during each visit.

Report on Activities of the Technical Subcommittee

Mr. Burrow reported that the Technical Subcommittee has been testing the cable system and has learned of improvements in the system. Mr. Sam Panchal spent two days measuring validity of the system. He made 20 calls to 4 patients and measured signal levels, conducted file transfers, and observed video quality. He recorded the results as follows: He received a video conference at 100% of the patient sites and on one occasion had no video at the Central Monitor Station.

Video quality	Patient System	Central Monitor Station
Excellent (Freeze 1-2 sec.)	27%	27%
Good (Freeze 3-4 sec.)	55%	50%
Average (Freeze 5-6 sec.)	18%	18%

They have found that there is a relationship between the signal level and a successful conference. If the level is between 1 and 1.4 V, the conference is usually successful. If it drops below .8 V, the conference is unsuccessful. When the outside temperature is above 95 degrees, the signal level drops below this level. Dr. Searle has informed Jones Intercable of this finding, and they have set the signals high to allow for the drop. This is the best way they can handle the problem.

Mr. Panchal found a correlation in the time it takes to complete a 10 mb file transfer and the quality of the video. When the video is excellent, file transfer requires less than 60 seconds. Thus, the file transfer rate can give some indication of the expected quality of the video. They are considering adding a test button which would initiate a file transfer and then report back on whether the connection should have high quality video.

Mr. Peifer added that Mr. Barry Sudduth has done testing on this and has found that it may be more a negative test than positive (If there is a slow transfer time there will be a bad conference, but if it is fast, it is not necessarily an indication of a good video conference.)

Mr. Toler asked about audio testing. Mr. Burrow replied that the audio had been working well essentially all of the time. Dr. Searle reported that during the middle of the testing, a patient consultation occurred with the Roberts home, and the system worked well.

Dr. Searle also reported that he was scheduled to visit six sites this week and expects that the first three will be ready to install Monday. By the end of this month he plans to have visited all the

sites, in order to stay on track with installations. Two of the first three sites needed grounding.

Jones Intercable will install another cable drop for each home for this project. They have hired seven new technicians to train for this work.

Ms. Barnes asked if there was an established order for bringing patients on-line. Dr. Searle responded that there was not an established order but that patients were contacted and visited as they were available in order to fill appointment slots for each day. Dr. Stachura suggested that there is a need to see all patients and to try to do it in the order in which they were consented.

The ISDN Connection between MCG and EAMC was tested and the audio and video were poor. Mr. Panchal and Mr. Vince Colwell worked on parameters but could not identify any visible problems. They noted that the Ascend box indicated that only 60% of the available bandwidth was being utilized. Mr. Horner stated that Mr. Colwell is working on this. He promised to have some answers by tomorrow.

Operational Changes at GIT Due to the Olympics

Due to the security which will surround Georgia Tech's lab within the Olympic Village, they will no longer be able to roll the systems out of their building. They will be transporting 6 systems to MCG to await installation and will be moving the other equipment to the new GCATT building for assembly. Dr. Stachura asked if the GCATT building is inside the Olympic Ring. Mr. Peifer explained that it is within the Olympic Ring but not within the security of the Village. Therefore, the only restriction on transportation of units is volume of traffic.

Mr. Burrow reported that all components have been received except boards and stethoscopes.

Report of the Evaluation Subcommittee

Mrs. Brown explained that Mr. John McCarthy, a doctoral student from the University of Michigan, is working on the Evaluability Study and is conducting interviews of various individuals involved in the project.

Report of the Operations Subcommittee

Mrs. Adams reported on the schedule of installing the Telemedicine equipment at EAMC. It is set for the 24th of June. The cabinetry subcontractor is waiting on materials. The validation is scheduled for the week of July 1. The technical training will occur July 15, 16, and 17.

She reported that in view of the Clinical Subcommittee and technical information, she will need to send manuals out for changes.

An issue was brought to the Committee concerning the funding for EAMC's nurse. The current Memorandum of Agreement ends on June 30. A handout was distributed explaining the

situation. The Committee voted to extend the funding through July with the ability to extend the contract through September. The motion will be faxed to absent members for their votes.

Mr. Toler suggested inviting a member from Jones Intercable to sit in on the meetings in order to keep them informed on decisions. Mr. George Paschal will be invited to the next meeting.

Report On Other Funding Sources

Dr. Stachura raised the question from Ms. Schlachta of whether the Committee is comfortable with allowing AT&T to look at the EHC as a medical modality on their network. She has a proposal to the NLM. This is not a request to include the EHC project in her RFP.

Mr. Toler suggested that it sounded similar to the TCI idea. He stated he doesn't mind their consideration but would want a detailed sheet of information on what they plan. He suggested setting up a demonstration for AT&T.

Dr. Stachura asked at what depth can they look at it and how the intellectual property issues or the conflict of interest issues affect this.

Mr. Toler replied that it is inappropriate for members to propose the use of the EHC without the endorsement of the Committee. He further informed the group that the intellectual property - record of invention for the hardware has been filed and copyright protection has been filed. GIT has filed, and will file with MCG. They are proceeding with the understanding that intellectual property rights are retained within the university. (Based on the 1984 federal law). He stated that he believes the Military believes that the rights belong to them as the funding agency.

Dr. Stachura raised the issue of consent forms. The consent forms as currently written authorize participation through June. Each patient may need to be re-consented for the time after July 1.

The next meeting will be set within two weeks - toward the end of June. The meeting was adjourned at 12:30 pm.

Action Item: **Mrs. Brown, Mrs. Edwards, and Dr. Stachura will create a form to be used by each nurse at each visit.**

Respectfully Submitted,

Patti Edwards

6/28/96

Electronic House Call Final Report

Topic	Content	Person(s) responsible	Due
Introduction			
	Brief history & objectives	MCG Kevin Grigsby	6/30/96
		GIT Jim Toler	6/30/96
		EAMC Dan Ward	6/30/96
	Literature review	John McCarthy	7/15/96
	The Consortium; Organizational structure of Steering Committee	Ann Brown	6/30/96
	Human Assurances & FDA issues	Kevin Grigsby	6/30/96
Project tasks			
	Short term & long term objectives	Kevin Grigsby & Rashid Bashshur	6/30/96
Short term tasks			
	Task 1: Link EAMC & GSAMS	Laura Adams & Jack Horner	6/30/96
	Task 2: Proof of concept and system demonstration	Mike Burrow, John Searle, John Peifer, Max Stachura	7/15/96
	System development & performance	Jim Toler & John Searle	7/15/96
	Clinical protocols	Max Stachura, Loretta Schlacta, physicians & nurses	7/31/96

Nursing home	Tom Jackson	7/31/96
System evaluation		
Evaluability assessment	John McCarthy & Rashid Bashshur	7/15/96
Formitive evaluation	Kevin Grigsby	7/31/96
Summative evaluation	Rashid Bashshsur	7/31/96
Task 3: Videotape & demonstration in Washington, DC	Max Stachura & Jim Toler	6/30/96
Task 4: Extend distribution through PC-based systems, etc..	Mike Burrow, John Peifer, John Searle, Vince Colwell	7/31/96
Long term objectives	Betsy Blakeslee	6/30/96
Conclusions	Rashid Bashshur	7/31/96
Appendices		
A. Steering Committee Membership Roster	Ann Brown	6/30/96
B. Steering Committee Meeting Minutes	Ann Brown	6/30/96
C. In-Home equipment list	Mike Burrow	6/30/96
D. Unit cost breakdown	Jim Toler, John Peifer	6/30/96
E. Jones Intercable area map	John Searle	6/30/96
F. Diagram of EHC	John Searle, Vince Colwell	7/15/96
G. Budget summary	Laura Adams	7/15/96

Issue for Discussion:

Funding for Eisenhower Nurse

On Feb. 1, 1996, the Steering Committee voted to fund a monitor nurse at EAMC through June, 1996. A Memorandum of Agreement was prepared by MCG to fund the nurse for the amount of $23,720 from Feb. 12, 1996 - June 28, 1996. The funds have been expended as dictated in the agreement and almost all will be expended by the end of June.

The Steering Committee needs to discuss continued funding for the nurse. To fund the nurse at the current rate of approximately $1186 per week through July would require $5,930; to fund through August would require $10,674, and through September $14,418.

AGENDA AGENDA AGENDA

STEERING COMMITTEE MEETING

FOR THE

ELECTRONIC HOUSE CALL PROJECT

June 26, 1996
10:30 am - 12 N
Telemedicine Center
Medical College of Georgia

CALL TO ORDER AND WELCOME

1. CONFIRMATION OF A QUORUM--P. Edwards

2. ACCEPTANCE OF MINUTES OF JUNE 12, 1996 MEETING--P. Edwards

3. ANNOUNCEMENTS--J. Toler

   o Global Telemedicine and Federal Technologies Symposium and Exhibition, Williamsburg, VA, July 8-10, 1996
   o TeleHomeCare 96, Chicago, IL, August 122-23, 1996
   o The Information Connection: Emerging Technologies Linking Patients and Providers, Burlington, VT, February 5-7, 1997

4. UPDATE ON THE STATUS OF THE REQUEST FOR A NO-COST TIME EXTENSION--M. Stachura

5. REPORT ON ACTIVITIES OF THE TECHNICAL SUBCOMMITTEE--M. Burrow

   o Cause of, and proposed solution for, problems with EAMC ISDN linkage
   o Status of system deliveries to MCG and system assemblies at GIT
   o Status of visits to patient homes in preparation for system installations
   o Operational changes at GIT due to the Olympics

6. REPORT ON ACTIVITIES OF THE CLINICAL SUBCOMMITTEE--M. Stachura

   o Status of efforts to define a data set to be recorded for each patient encounter
   o Status of efforts to create a standardized form for data collection by visiting nurses
   o Status of efforts to extend dates on patient consent forms

ehc.39

7. **REPORT ON ACTIVITIES OF THE EVALUATION SUBCOMMITTEE**--K. Grigsby

8. **REPORT ON ACTIVITIES OF THE OPERATIONS SUBCOMMITTEE**--L. Adams

- o Status of GSAMS installation at EAMC

9. **MISCELLANEOUS**

- o Status of FAX to Committee members regarding desire to extend funding for EAMC nurse through July 1996
- o Report on **Telemedicine 2000 Conference and Exhibition**
- o Report on **Telemedicine 2001: New Technologies, Realities, and Communities**
- o BITC move to new GCATT Building
- o Update on inclusion of the EHC system in EAMC proposal to NLM
- o Update on recent program development activities
  - o Meeting with ICSN, CVS, Pfizer, Intel, and VTel on June 20, 1996
  - o Meeting with Johnson & Johnson on August 1, 1996
  - o NSF/Whitaker RFP titled "Multidisciplinary Reseearch and Education in Cost Reduction Health Care Technologies

10. **NEXT MEETING DATE/TIME/PLACE**--All

C-132

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- ★ HealthTech Services Corp
- ★ HELP Innovations
- ★ International Telemedicine Center
- ★ TEVITAL

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President
American Telemedicine Association
Eminent Scholar of Telemedicine
Medical College of Georgia

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- ✓ Hear Details of World's First Successful Commercial Home Telemedicine Venture
- ✓ Overcome Legal Obstacles for Home Telemedicine
- ✓ Learn Market Forces Driving the Development of Telemedicine for Home Care
- ✓ Learn Specific Strategies to Integrate Telemedicine Into Your HomeCare Program
- ✓ Identify the Market Potential for Home Telemedicine Applications

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EAMC Patients:

3 are installed: Collins, Costello, Kohlmeyer

5 have been visited for initial visit: Borden, Goins, Jackson, Lloyd, and McCool

All electrical work has been completed

Jones Intercable has completed Borden **(ready to install system)**

Goins and Jackson are ready for modems (should be comp. today)

Waiting on status of other homes from Jones Intercable

Will need 5 more patients to complete 13 homes

MCG Patients:

1 is installed: Roberts

5 have been visited for initial visit: Culver, Long, Parks, Simmons, White's is scheduled for 6/27

Dr. Louard recommended Hodges not participate based family working hours

4 more patients have been identified by physicians/ we are awaiting for the physicians to confirm patient interest before scheduling visits.

Electrical work has been completed on all

Long home should be set up today per Jones

Waiting on status of other homes from Jones Intercable

Will need 3-6 more patients to complete 12 homes.

Wednesday, June 26, 1996

ANSWER

Pt_Name	Inst	Doctor	Zone	Identify	Consent	Visit	JIC_OK
Culver, Mary	Medical College of Georgia	Mensah, MD, George	0	6/20/96		6/25/96	
Hodges, Tameika	Medical College of Georgia	Louard, MD, Rita	0	2/15/96			
Hogan, Katherine	Medical College of Georgia	Louard, MD, Rita	0				
Jones, Margaret	Medical College of Georgia	Mensah, MD, George	0				
Long, Quieshana	Medical College of Georgia	Guill, MD, Margaret	0	4/15/96	4/15/96	6/13/96	
Parks, William	Medical College of Georgia	Davis, MD, W. Bruce	0	6/5/96		6/18/96	
Quiller, Jean	Medical College of Georgia	Louard, MD, Rita	0				
Roberts, Cyndreka	Medical College of Georgia	Guill, MD, Margaret	0	2/14/96	2/26/96	2/21/96	2/26/96
Simmons, Delores	Medical College of Georgia	Davis, MD, W. Bruce	0	2/15/96		6/13/96	
Spencer, Evelyn	Medical College of Georgia	Mensah, MD, George	0				
White, Fannie A.	Medical College of Georgia	Stachura, MD, Max	0	6/18/96		6/27/96	

Wednesday, June 26, 1996

ANSWER

Pt_Name	Inst	Doctor	Zone	Identify	Consent	Visit	JIC_OK	
Borden, Gudrun	Eisenhower Army Medical Center	Butcher, MD, Janus	0	4/29/96	5/6/96	6/11/96		
Collins, Mildred	Eisenhower Army Medical Center	Lepler, MD, Lawrence	0	2/29/96	3/1/96	3/20/96	3/28/96	3
Costello, Noreen	Eisenhower Army Medical Center	Epperly, MD, Ted	0	2/15/96	3/20/96	3/20/96	3/28/96	4
Gay, Robert	Eisenhower Army Medical Center	Nash, MD, Barrington N.	0	3/6/96	3/7/96			
Goins, George W.	Eisenhower Army Medical Center	Butcher, MD, Janus	0	3/20/96	3/20/96	6/11/96		
Jackson, Louise	Eisenhower Army Medical Center	Arthur, Ansermo L., M.D.	0	3/15/96	3/22/96	6/11/96		
Kohlmeyer, Mrs. Flora	Eisenhower Army Medical Center	Jerant, MD, Anthony	0	2/14/96	2/15/96	2/21/96	2/26/96	2
LaFontaine, Ollie	Eisenhower Army Medical Center	Lepler, MD, Lawrence	0	2/22/96	2/26/96			
Lloyd, Andree	Eisenhower Army Medical Center	Whitlock, MD, Warren	0	2/12/96	2/14/96	6/13/96		
McCool, Gladys	Eisenhower Army Medical Center	Nash, MD, Barrington N.	0	2/23/96	3/8/96	6/18/96		

Instructions for Patient Connections with EHC System:

Schedule with patient a convenient time for the connection
MCG nurses record scheduled time/date in electronic calendar
(Goal is 4 connections per week with each patient, testing all peripheral measurements except EKG each time)

Make connection and complete 5x7 card as you perform each measurement.

Record values and any other clinical information on clinical note in patient's file.

When needed, alert physician of clinical findings.

Return all 5x7 cards to Patti Edwards weekly

Electronic Housecall Patient Visits

Patient Name	Instn.	Physician	June 17-21	June 24 - 28	July 1 - 5	July 7 - 11	July 14 - 18	July 21 - 26	July 29 - 02	August 05-09	August 12-16	August 19-23	August 26-30
Kohlmeyer, Flora	EAMC	Jerant											
Collins, Mildred	EAMC	Lepler											
Costello, Noreen	EAMC	Epperly											
Roberts, Cyndreka	MCG	Guill											

Information to be abstracted from patient hospital record by nurse

Name
Address
Date of Birth
Gender
Marital Status
Education
Clinical status
Clinical history (summary)

Outpatient visits

Date
Site
ER/scheduled visit
location
distance from home
time from home

diagnostic tests
- radiology
- laboratory

procedures
prescriptions
- medications
- diet
- therapies

request follow up

Hospital Admissions

Date admitted
location
type of service (general medicine, surgery, etc)
diagnostic tests
- radiology
- laboratory

procedures
prescriptions
- medications
- diet
- therapies

date discharge
follow up request

Information to be recorded from home visit/interview with patient by nurse

Household composition
number
relationship
home support
perceived health status

To be gathered by nurse after patient has used EHC system for several weeks

Frequency of use
reliability
convenience
ability to manipulate equipment
    recording specific difficulties
range of equpment used
desired changes in equipment

Information to be gathered from Dr. Grigsby's visit with patient after using EHC system for several weeks:

Attitudes toward technology
    ability to explain problem
    ability of provider to understand
    preference vis a vis in person
    personal treatment
    privacy

Perceived benefits
    gains or losses in:
        technical quality of care
        interpersonal quality of care
        convenience/access
        other: psychological, social

Electronic House Call Project
Steering Committee Meeting
June 26, 1996
10:30 am

The Steering Committee of the Electronic House Call Project met on Wednesday, June 26, 1996, at Medical College of Georgia.

Members Present	**Institution**
Mr. Mike Burrow	Georgia Institute of Technology
Dr. Kevin Grigsby	Medical College of Georgia
Mr. Jack Horner	Eisenhower Army Medical Center
Mr. John Peifer	Georgia Institute of Technology
Ms. Loretta Schlachta	Eisenhower Army Medical Center
Dr. Max Stachura	Medical College of Georgia
Mr. Jim Toler	Georgia Institute of Technology
Dr. Dan Ward	Eisenhower Army Medical Center

Members Absent	**Institution**
Mrs. Laura Adams	Medical College of Georgia
Dr. Betsey Blakeslee	Eisenhower Army Medical Center
Dr. Dan Rahn	Medical College of Georgia
Dr. Jay Sanders (Ex-officio)	Medical College of Georgia

Other Attendees: Ms. Ann Brown, (MCG), Ms. Patti Edwards, (MCG), Dr. John Searle, (MCG)

Welcome

Mr. Toler, Chairman, called the meeting to order and confirmed that everyone received the agenda.

Confirmation of Quorum

Mrs. Edwards confirmed that a quorum was present.

Approval of Minutes from past Meetings

Minutes from the May 15, 22, and June 12 meetings were approved.

Announcements

Conferences

Mr. Toler asked everyone to note upcoming telemedicine-related meetings listed on the Agenda.

Status of Request for a No-Cost Time Extension

Dr. Stachura gave the status report for the no-cost time extension. He announced that an E-Mail had been received at Fort Gordon that the extension through September 30 had been granted. He

expects the official letter to be forthcoming. This means the final report will be due on October 31.

Report on Activities of the Technical Subcommittee

Mr. Burrow reported that the ISDN line had been tested. Mr. Sam Panchal spent a day working on this and the main cause of concern is that only 60% of the bandwidth available is being used. They are attempting to figure out if there is a problem in the lines. The EAMC representatives believe it may be the line between EAMC and MCG. They need to get an Ascend monitor to help identify the problem. Mr. Burrow reported that Mr. Panchal will come tomorrow to work more on this problem. Although it worked with the regular ISDN line, the use of the Ethernet mode seems to cause a problem. The possibility of a bad line into the MCG lab was mentioned. Mr. Toler reminded the group that this issue needs to be resolved no matter what it takes.

Mr. Burrow added that the goal for installation was 3 systems per week. In response to that, six units were brought to Augusta. The question of how many homes are ready for installation was raised. Mrs. Edwards reported that she has repeatedly asked Jones Intercable for a schedule and they are not able to provide one. Mr. Toler volunteered to work with Jones Intercable on this issue.

Mr. Horner reported that one of the Eisenhower planned patients is in the hospital and one has decided not to participate, so they will need to find some additional patients.

According to information from Jones Intercable this morning, three addresses will be ready for installation by tomorrow. Mrs. Edwards will serve as the single point of contact for patients and problems.

Ms. Schlachta expressed frustration on behalf of Eisenhower's nurse in that her system has been connecting intermittently and sometimes not at all. She needs a person to call for technical support.

Dr. Stachura stated that if Jones has four systems ready to be installed by the end of the week, then we will be 5 behind on the target. He would like to target July 31 for all installations. There is some room for slippage.

Mr. Toler asked if Jones Intercable was involved in the planning of the schedule. Dr. Stachura responded that they were in fact involved. He stated we need more patient names to supply Jones so they may begin work on the addresses.

Mr. Toler stated he would try to go to Jones' office this afternoon following the meeting.

Mr. Burrow reiterated that they have 3 systems in the GIT lab waiting on Intel Pro systems.

These should be completed with the installation of the systems. Then 9 will be ready. They have moved from their building to the new GCATT building due to the upcoming Olympics.

Update on Activities of the Clinical Subcommittee

Dr. Stachura stated that the patient consents have been taken care of. He is working on recruiting more patients by telling the clinicians the patients do not have to be as ill as originally anticipated; they should just live in the geographical area covered. The Subcommittee is working to centralize scheduling for MCG patient contacts. Mrs. Brown will be the clinician contact while Mrs. Edwards will be the patient contact. All patient contacts will be scheduled due to the anticipated volume of connections once all patients are operational. The Subcommittee is working to develop forms for the technical data which needs to be collected.

Mr. Horner asked if we are discouraging patients from calling in. Dr. Stachura responded that we are not discouraging calling in, but based on the time constraints, unannounced visits will be difficult to fit in. Some of the scheduled visits will be initiated by the patients and some by the monitor station. Dr. Grigsby suggested we neither encourage nor discourage this.

Mr. Burrow stated if it comes to the point where ISDN lines are going to share time on one system (if the ISDN problems cannot be worked out for Eisenhower), would it be possible to have a second station at MCG?

Ms. Schlachta stated that one of the reasons we were going to not have EAMC patients seen at MCG is because of legal reasons. Not will that not be a problem? Dr. Stachura stated that it would not be a problem because EAMC's nurse will be seeing them. This might raise potential conflict, which he will deal with.

Ms. Schlachta stated that Ms. Barnes has been visiting patient #2 and had trouble connecting. Later she found out the system had been disconnected, but she did not know about it. The group discussed the need for technical people to contact the nurses before disconnecting the systems in case a connection has been scheduled for that day. Ms. Barnes will be making her own patient appointments, but will be in daily contact with Ms. Edwards about the planned connections. Ms. Edwards will ask Jones Intercable to contact her before disconnecting any portion of the cable.

Mr. Horner asked if the ISDN line connections never improve, will the 60% accuracy be too poor to obtain data? Dr. Stachura stated it may work well enough to obtain data.

Dr. Stachura raised the issue of publicity. He had a telephone call of inquiry from the MCG News Bureau Coordinator and asked for the group's opinion of what information should be released. Mr. Toler suggested publicity be confined to two systems side by side at this point, and not go into patient homes.

Ms. Schlachta relayed that Ms. Barnes feels the EKG acquisition time is too short. It is 30 seconds. The temperature acquisition time is too long. She asked if it could be turned off manually or if a time period could be selected. The technical people offered to assist with this.

Dr. Stachura restated that for issues like these, the nurse should be able to pass to Patti and she will coordinate a response from a technical person.

Report of the Evaluation Subcommittee
Dr. Grigsby stated there are three parts to the evaluation: The Evaluability Assessment is being completed by Mr. John McCarthy. The Formative portion will be from data collected once patients have used the system for several weeks. The Summation will be an assimilation of all the information. He believes we will have more data collected if we are allowed October to complete the final report.

Report of the Operations Subcommittee
Mrs. Adams reported on the schedule of installing the Telemedicine equipment at EAMC. It is to be completed this week. The cabinetry delay is pending. Lines have been ordered and are anticipated to have no problems.

Miscellaneous
Mr. Burrow reported on the status of the nursing home, Dr. Jackson's home, and office. He stated the equipment has been installed in his home, the nursing home, and his office. The nursing home personnel will need to be trained.

Ms. Schlachta and Mr. Burrow reported on the conference in Chicago. They stated there were approximately 300 people at the conference and that home telemedicine was featured. Both made presentations.

The group decided to meet in two weeks.

Respectfully Submitted,

Patti Edwards

7/9/96

Electronic House Call Project
Steering Committee Meeting
July 17, 1996
2:00 pm

The Steering Committee of the Electronic House Call Project met on Wednesday, July 17, 1996, via video teleconference between Medical College of Georgia and The Board of Regents building in Atlanta.

Members Present	**Institution**
Mrs. Laura Adams	Medical College of Georgia
Mr. Mike Burrow	Georgia Institute of Technology
Mr. John Peifer	Georgia Institute of Technology
Ms. Loretta Schlachta	Eisenhower Army Medical Center
Dr. Max Stachura	Medical College of Georgia
Mr. Jim Toler	Georgia Institute of Technology

Members Absent	**Institution**
Dr. Betsey Blakeslee	Eisenhower Army Medical Center
Dr. Kevin Grigsby	Medical College of Georgia
Mr. Jack Horner	Eisenhower Army Medical Center
Dr. Dan Rahn	Medical College of Georgia
Dr. Dan Ward	Eisenhower Army Medical Center

Other Attendees: Ms. Ann Brown, (MCG), Ms. Patti Edwards, (MCG), Ms. Krinna Patel, (MCG), Mr. Harry Hess (Jones InterCable), Ms. Debbie Durham (MCG) Ms. Jean Barnes (EAMC)

Welcome

Mr. Toler, Chairman, called the meeting to order. He announced that this would be a meeting to discuss progress and technical problems and how to best resolve them. He asked if anyone had other items to discuss. Ms. Schlachta added that she would like to discuss technical support and Jones InterCable's responsiveness to this project, as well as the contract for Eisenhower's nurse.

Ms. Adams indicated that the extension of the contract for Eisenhower's nurse, Ms. Jean Barnes, through the project end date of September 30, 1996, would be handled by MCG.

Mr. Toler announced that a meeting was to be held Monday, July 22, 1996 at the Telemedicine Center to discuss technical issues involving Jones InterCable. Mr. George Paschal and Mr. Harry Hess of Jones InterCable will be attending.

Mr. Burrow commented that Mr. Andy Hopper was in Augusta Tuesday and Mr. Barry Sudduth is there today. They recognized that three patients installed two weeks ago did not show up on the Eisenhower Central Monitor Station because there was no opportunity to add them that day. Andy was to add them today, and now should be considered fully installed.

Ms. Schlachta asked if all EAMC patient names are on MCG's central monitor station. Mrs. Brown responded that Ms. Debbie Durham, MCG's monitor nurse, had added all the names and IP addresses to her station. Mr. Peifer stated he would like to look into this - if they are not added, they can be. Since each patient station is programmed to channel information to one central monitoring station, data recorded during connections to MCG cannot be transmitted to EAMC's monitor station.

Ms. Barnes relayed that her monitor station is totally frozen. She attempted to connect with patient #2 this morning and had poor audio. She reported Mr. Sudduth is at Eisenhower now. Mr. Peifer stated that there is a new software release to install in all the systems to prevent problems in the future. The goal is to install the new software by August 1. They will continue to test it in the lab through the end of next week.

The ISDN lines - Mr. Burrow stated that Mr. Hopper tested the lines with the network expert and made adjustments to the Ascend box to let them call in both directions. The ISDN lines function properly, which was verified by a connection from John's line to EAMC, taking Jones InterCable out of the "loop." This is an issue for Jones to discuss. Mr. Burrow reported that Dr. John Searle noted in monitoring Jones InterCable's network that it appeared the signal level is satisfactory, but the noise is substantial. He was to notify Jones that they appear to be the weak "link." Mr. Toler stated he had concerns that the switches were incorrectly set but now he does not believe that is the problem.

Ms. Durham stated that connections made from her monitor station appear better than those made from Dr. Searle's lab.

Ms. Barnes spoke with the Center for Total Access about the link between the ISDN lines and the Jones Cable. They now believe that is not the problem. She stated she has never been able to monitor respiratory rates from her station, yet from MCG's station in Ms. Durham's office, she can do so.

Ms. Barnes further commented that hen she first went on line, her connection was satisfactory most of the time, and now it has deteriorated.

Mr. Burrow stated the noise level on the signal increased about two weeks ago, when Ms. Barnes noted a decrease in quality.

The group discussed troubleshooting strategies and the best way to report problems. They decided that the nurses would be the first people to notice problems, and should notify Ms. Brown in writing (E-mail or fax) of the problem and at the same time report it to Mr. Burrow by fax or e-mail. Then Ms. Brown will have a log of all problems reported, and Mr. Burrow will report back to her on the problem's status. Mr. Burrow will be responsible for contacting Jones InterCable (Mr. Harry Hess) when the problem is with the cable.

Ms. Schlachta requested a technical person to be in Augusta to be available when problems arise, at least for several weeks. Dr. Stachura agreed with the validity of this request. Mr. Burrow agreed that they would work out a schedule for technical support to be in Augusta part of each week.

The group agreed to meet again in several weeks.

Respectfully Submitted,

Ann Brown

7/24/96

Electronic House Call Project
Steering Committee Meeting
August 5, 1996
1:30 pm

The Steering Committee of the Electronic House Call Project met on Monday, August 5, 1996, at the Medical College of Georgia.

Members Present	**Institution**
Dr. Betsey Blakeslee	Eisenhower Army Medical Center
Mr. Mike Burrow	Georgia Institute of Technology
Dr. Kevin Grigsby	Medical College of Georgia
Mr. Jack Horner	Eisenhower Army Medical Center
Mr. John Peifer	Georgia Institute of Technology
Ms. Loretta Schlachta	Eisenhower Army Medical Center
Dr. Max Stachura	Medical College of Georgia
Mr. Jim Toler	Georgia Institute of Technology

Members Absent	**Institution**
Mrs. Laura Adams	Medical College of Georgia
Dr. Dan Rahn	Medical College of Georgia
Dr. Dan Ward	Eisenhower Army Medical Center

Other Attendees: Ms. Ann Brown, (MCG), Ms. Patti Edwards, (MCG), Ms. Krinna Patel, (MCG), Mr. Harry Hess (Jones InterCable), Mr. George Paschal (Jones InterCable), Ms. Debbie Durham (MCG) Ms. Jean Barnes (EAMC), Dr. John Searle (MCG), Mr. Vince Colwell (EAMC), Ms. Pat Dekle (MCG)

Welcome

Mr. Toler, Chairman, called the meeting to order. He asked Mrs. Edwards to confirm that a quorum was present. She did so. He then asked for acceptance of the minutes of the June 26, 1996 meeting. The minutes were approved with changes submitted. Mr. Toler reviewed upcoming conferences listed on the Agenda.

Review of Working Meeting at MCG on July 22, 1996

Mr. Toler asked members to review notes from the working meeting held on July 22. He reviewed that technical problems should be reported to Mr. Burrow, who will determine the nature of the problem and find who should take care of them. He asked for a verbal update on the number of connections made and how they went. Mrs. Barnes indicated she had sent a fax of her problems for the past two weeks.

Mr. Toler asked Mrs. Brown if this mechanism for troubleshooting is working well. She suggested the nurses respond with their opinions. Mrs. Barnes indicated that patient #2 is

still having problems. Mr. Sam Panchal has told her that a cable problem was the cause of the problems and she is unsure of the status of this.

Mr. Burrow stated that every problem, even if reported to Mr. Panchal or another Georgia Tech person, needs to be logged in to the log. It is valuable to know which connections work well, along with which do not work as well.

Mr. Hess stated that he checked patient #2's Friday and it worked fine. He added that his men are working on patient #4's home now and Mrs. Barnes indicated that she had problems with patient #2 this morning at 9:53 when she connected. She stated that in a conference last Wednesday, it took four minutes before she received a video picture of the far site.

Mr. Paschal suggested switching the unit in patient #2's house for another since it seems the network is not the problem. Mr. Burrow stated it is the only home which has had consistent problems.

Mrs. Durham stated she has received a 24 hour response on every problem she has reported. She had problems with software, image problems, audio, and the stethoscope. She has had a 100% connection success rate but in 10% of connections has slow moving video.

Mrs. Barnes stated that with patient #4, she had low audio on both sides. She questions the accuracy of some of the parameters due to incompatible results received during several trials. She reported that with patient #24, the audio breaks up and has short freezing episodes with status on line after the thermometer is used. With patient #22, she gets some freezing of the video, but the parameters work fine.

Mr. Burrow stated he would see if Mr. Panchal can come tomorrow to change patient #2's system. The group discussed patient courtesy and if this should be done prior to or along with software updates, which are scheduled for next Thursday and Friday. They decided that it would be accomplished along with the upgrade to prevent two visits to the home within a week. Mr. Panchal will arrange with Mrs. Edwards.

Mrs. Barnes stated she had misconceptions of the technical support which was to be provided by Georgia Tech. She understood technical support in Augusta was to be provided to address problems as they arise.

Mr. Toler responded that there has been technical support in Augusta much of the time.

Ms. Schlachta expressed her opinion that the process is inadequate and she would prefer someone here daily to oversee problems as they occur. While technical support has been present intermittently, there is no dedicated, on site support to troubleshoot problems as they occur and

to resolve them. She made a motion that the technical subcommittee meet and make a recommendation on the technical support issue.

Dr. Grigsby seconded the motion. During the discussion, Mr. Horner suggested that the meeting be held within 24 hours.

The Technical Subcommittee agreed to meet following this meeting.

Report on Activities of Technical Subcommittee
Mr. Burrow stated that 10 systems are installed in homes - 8 EAMC and 2 MCG, along with the 4 Central Monitor stations (MCG, EAMC, Dr. Jackson's home and office). The nursing home is operational to Dr. Jackson's office, but his home did not have a good connection.

Report on Activities of Clinical Subcommittee
Dr. Stachura stated Mrs. Durham is setting up the consents with the nursing home.

Report on Activities of Evaluation Subcommittee
Dr. Grigsby reported that the Evaluation Subcommittee's work is contingent upon the how the technical issues are resolved. Forms have been developed to pul out relevant patient data and demographic data needed. Dr. Bashshur and Mr. John McCarthy from University of Michigan have been working on the evaluability issue. He suggested making a 10 day limit after which he would like to move ahead with interviewing patients who have participated thus far. He would like to have a meeting of the evaluation subcommitee within the next two weeks.

Dr. Stachura asked if the evaluability data would be shared.

Dr. Blakeslee asked if this evaluation would be involved with the military's evaluation. Dr. Grigsby responded that it was not written into the contract to collaborate with the military's evaluation, but he would be most interested in meeting with the individuals responsible for it.

Ms. Schlachta asked what would be evaluated. Dr. Grigsby responded that we would look at what clinical data is available and the subjective experience of the 10 participating patients.

Report on Activities of Operations Subcommittee
The Operation Subcommittee had not met since the previous meeting.:

Report of Efforts to Secure Continued Funding
Dr. Stachura reported on a meeting with Johnson and Johnson's telemedicine committee which occurred on August 1. Dr. Tedesco asked for this demonstration of the system in conjunction with presentations from several other groups on campus. He stressed that this was an MCG endeavor and all partners (GIT and Departement of Defense) were mentioned. This is part of a

general search for a corporate partner for MCG and it is too early in the process to discuss any specific relationships. He added that he has approached the legal authorities on campus regarding licensure, and they have indicated that someone from an upper level would contact us.

Mr. Toler stated that under the subcontract, there is a legal obligation to let the Army know if something is to be licensed. This would be done officially.

Dr. Blakeslee responded that the military wishes to reap benefits for its own people rather than cornering a market for financial benefits.

Mr. Toler announced that ICSN (Integrated Communication System Network) is interested in the Housecall project. They contacted him two weeks and wanted to meet, but he hasn't heard from them again.

Dr. Stachura added that the University of Miami has a complex nursing home extended care system which is interested in data collection also.

The next meeting will be held next Monday, August 12 at 1:30 pm.

Respectfully Submitted,

Ann Brown

9/03/96

Electronic House Call Project
Steering Committee Meeting
August 12, 1996
1:30 pm

The Steering Committee of the Electronic House Call Project met on Monday, August 5, 1996, at the Medical College of Georgia.

Members Present	**Institution**
Mrs. Laura Adams	Medical College of Georgia
Mr. Mike Burrow	Georgia Institute of Technology
Dr. Kevin Grigsby	Medical College of Georgia
Mr. Jack Horner	Eisenhower Army Medical Center
Mr. John Peifer	Georgia Institute of Technology
Ms. Loretta Schlachta	Eisenhower Army Medical Center
Dr. Max Stachura	Medical College of Georgia
Mr. Jim Toler	Georgia Institute of Technology

Members Absent	**Institution**
Dr. Betsey Blakeslee	Eisenhower Army Medical Center
Dr. Dan Rahn	Medical College of Georgia
Dr. Dan Ward	Eisenhower Army Medical Center

Other Attendees: Ms. Ann Brown, (MCG), Ms. Patti Edwards, (MCG), Mr. Harry Hess (Jones InterCable), Ms. Debbie Durham (MCG) Ms. Jean Barnes (EAMC), Dr. John Searle (MCG), Mr. Vince Colwell (EAMC), Ms. Pat Dekle (MCG)

Welcome

Mr. Toler, Chairman, called the meeting to order. He asked Mrs. Edwards to confirm that a quorum was present. She did so. He announced that minutes from the previous meeting will be considered at the next meeting. Mr. Toler reviewed upcoming conferences listed on the Agenda.

Report of the Technical Subcommittee

Mr. Burrow prepared a summary of the technical subcommittee meeting held August 5, 1996. He stated there are two primary areas of discussion - technical support, and testing results from the Center for Total Access testing of ISDN lines. They agreed to have someone in Augusta Monday through Friday to assist the nurses in identifying problems. The technical support person will take immediate action and get back with the nurses on the status of problems. This will improve communications. The problems the nurses have will be documented and provided to Mrs. Ann Brown to log. The previous method of faxing the problems to Georgia Tech will no longer be necessary. The technical support person will initiate correction of any problems reported.

Mr. Colwell suggested that the ISDN line has been tested and his opinion is that it does not need to be retested. He stated that they found the system works better in the "smoother" mode.

Ms. Barnes called patients using the smoother mode to test the RF/ISDN combination. They had difficulty with patient #2, but this is not an ISDN problem. They have swapped out the system at this residence, but it did not make a significantly better video. They could change the RF Modem, and plan to do this today.

Software update - The Software was upgraded on Thursday and Friday of last week. All homes worked well with the exceptions of patients #9 and #10. They recommend testing today and tomorrow with the new software. By Wednesday, if everything goes well, Mrs. Barnes can begin making all her connections from EAMC.

The new software is a new version of ProShare as well as the EHC software. They have upgraded the software at EAMC and tried to connect to MCG, but could not connect. They are trying to figure out why.

Mr. Peifer explained that there is a decision about the software that the clinical subcommittee needs to decide upon. Choice 1 is that the patient can connect to one designated Central Monitor Station but the database can be linked, and this would require undedicated lines. Choice 2 involves dedicated lines and the patient able to call but no cross-communication with the monitor stations or databases. This method was selected; each nurse will maintain her patients independently.

Dr. Stachura asked if simultaneous connections would be possible. Mr. Burrow responded that theoretically this should be possible, but they would like to test it and keep up with it. The performance will probably be degraded if simultaneous connections are made. They recommend coordinating the scheduling of calls to avoid simultaneous connections.

Dr. Stachura stated that the committee recommended a temporary hold on installations several weeks ago. He asked if adequate progress has been made to recommend going ahead toward the goal of installations in 25 homes.

Mr. Peifer reminded the committee that Jones InterCable had asked where to allocate their resources - preparing homes for installations or troubleshooting network problems. He suggested their input be used in deciding to resume installations. Mr. Harry Hess of Jones InterCable stated he needed two modems placed and has two other homes that are easy to do. He would be able to accomplish these by next Wednesday with minimal resources.

Mr. Toler asked how many homes would be ready for installation by a next Wednesday. Harry responded that he could have three ready and possibly four. Ms. Edwards also stated there is a home that is ready for installation with no work required by Jones InterCable. Therefore, four or possibly five homes could be ready. Mr. Burrow stated he would like to install the four next Wednesday. Mrs. Barnes asked if they could install any earlier than next Wednesday if ready.

Mr. Burrow replied that they would try to install two this week and two next week.

The question arose as to whether the homes with one system and two patients would count as one or two of the 25 installations. EAMC will have two such families. It was decided that they will count as one installation but two patients and EAMC will not seek to identify more patients until MCG's full complement of patients is up.

Mrs. Schlachta asked if the Nursing Home patient connections need to be scheduled along with the private patients. Mr. Burrow responded that the use of this connection may degrade the other sites if conducted simultaneously. Mrs. Barnes stated she is usually finished with her calls by 11:30 am.

Mr. Colwell asked what the criterion is for deciding when the system is working well enough not to have GIT here all the time. Mr. Burrow responded that when the nurses feel comfortable and have good quality connections it will be working well enough.

Mr. Burrow said he would look to Mrs. Edwards and Mrs. Brown for scheduling installations.

Mrs. Barnes asked how she should progress once the database is upgraded. Mr. Burrow asked her to contact Dr. Searle's lab and then call patients one by one to test out the new database. He stated they will need assistance with that. Mr. Barry Sudduth will be in Augusta later in the week.

Mrs. Brown asked for direction on how to proceed with patients who have been identified. Mr. Hess stated the addresses at 15th and 7th Streets would not be viable for Jones to complete. These patients should be notified.

Mr. Burrow stated that in regard to patient #10, Mrs. Barnes should go ahead and train her while they are working on the connection. It is there but there are problems being worked on. Mrs. Barnes stated she would prefer to wait until it works to train this patient. Whether a patient can be trained after the equipment has been installed and before the connection is live will be handled on a case by case basis. The protocol presented by the Operations Subcommittee indicates that training may occur prior to having a live connection.

The next meeting will be held on Monday, 8/19/96 at 1:30 pm.

Respectfully Submitted,

Ann Brown
9/03/96

Electronic House Call Project
Steering Committee Meeting
August 19, 1996
1:30 pm

The Steering Committee of the Electronic House Call Project met on Monday, August 19, 1996, at the Medical College of Georgia.

Members Present	Institution
Mr. Mike Burrow	Georgia Institute of Technology
Mr. John Peifer	Georgia Institute of Technology
Mr. Jack Horner (rep. by Ms. Jean Barnes)	Eisenhower Army Medical Center
Dr. Max Stachura	Medical College of Georgia
Mr. Jim Toler	Georgia Institute of Technology

Members Absent	Institution
Mrs. Laura Adams	Medical College of Georgia
Dr. Betsey Blakeslee	Eisenhower Army Medical Center
Dr. Kevin Grigsby	Medical College of Georgia
Ms. Loretta Schlachta	Eisenhower Army Medical Center
Dr. Dan Rahn	Medical College of Georgia
Dr. Dan Ward	Eisenhower Army Medical Center

Other Attendees: Ms. Ann Brown, (MCG), Ms. Patti Edwards, (MCG), Ms. Debbie Durham (MCG), Dr. John Searle (MCG)

Welcome

Mr. Toler, Chairman, called the meeting to order. A quorum was not present at this meeting due to travel of Eisenhower's representatives. He announced that minutes from the previous meeting will be considered at the next meeting.

Report of System Usage

Mr. Burrow reported that they had observed Ms. Durham making many calls and all went well. Ms. Barnes made many calls with Mr. Barry Sudduth observing, and for the most part, they went well. An update has been sent out to report on all the calls made the results of each. There are four homes not working. Patient #13 did not work, but Ms. Durham stated it was working as of Friday afternoon. Patient #9's home still did not work due to a cable problem, and Eisenhower will continue to test the connection. Patient #2's home continues to have problems, although the cable modem and hardware have been switched. Patient #10's home is not working, and will need some work. Two homes will be installed tomorrow - one EAMC home (patient #45 & #46) and one MCG home (patient #33).

Mr. Burrow said that the general feeling of the engineers is that the system usually works properly if the cable connection is good. The problems mostly result from noise in the system.

Dr. Stachura stated that is positive information. He asked Ms. Barnes about Eisenhower's two families in which both husband and wife are patients. He stated the group needed explanation of how these families were to be counted. Ms. Barnes indicated that Eisenhower has decided to count each patient as a "connection", thus counting their current installations in ten homes as twelve connections, based on the two additional patients at these homes. They need only one additional patient to complete their goal of thirteen.

There is some question on the status of four homes that are "on hold" for installation because of concern over the length of the cable run or labor force issues within Jones Intercable. These patients need to be installed to enable MCG to complete their full group of patients, and have been expecting to be connected for some time; however, the cable company prefers not to connect these homes, located in hub 0, due to reasons listed above. Dr. Stachura stated that someone needs to contact Mr. Harry Hess or Mr. George Paschal at Jones Intercable to determine if they are willing to try to connect these homes. Also, we need to determine if Jones is interested in continuing past the September 30 end date, should additional funding become available. Mr. Toler offered to contact Mr. Raley in the Jones Intercable Denver headquarters, while Dr. Searle/Dr. Stachura contact Mr. Paschal in Augusta.

Ms. Barnes said she understood four systems were to be installed per last week's meeting. She asked if any of these four were EAMC patients. Two of the four have been installed and the other two will be installed this week. Two are Eisenhower patients.

Mr. Burrow asked about this morning's connections. Ms. Barnes responded that patient #24's connection was choppy, patients #2 & #4 did not show the parameters on the screen, and patient #22 was a perfect connection. Patient #10 has a connection problem (Mr. Sam Panchal spoke with Mr. Harry Hess of Jones Intercable about this), and patient #3 is back in the hospital.

Ms. Durham reported that she had some small problems, which were all easy to correct. She connected with patient #33 and patient #13, and wants to continue connecting with these on a regular basis, if this is ok with the committee (during last week's meeting the direction was given to wait until 8/21/96 to begin regular connections with the newly installed patients.)

Eisenhower will have one additional patient ready for installation. They will install it as soon as possible. MCG has seven names, but four are "on hold" per Jones Intercable. Dr. Stachura would like to see these seven move as soon as possible, and instructed Mrs. Brown and Mrs. Edwards to try to recruit some additional patients.

Georgia Tech will take "call" from Atlanta on Thursday and Friday, since both nurses will be out of town these days and there will be minimal connections.

Dr. Stachura mentioned an operational issue: He would like Ms. Durham to connect with the nursing home separately from Dr. Jackson's connections to test the quality of the connections and to complete cards on these connections. Dr. Jackson's connections are not restricted by scheduling. He will use the equipment as needed. Mr. Peifer stated this should not cause any problems if simultaneous connections occur with the nursing home.

Mr. Toler said he would like to know who has made presentations on the Electronic House Call Project. Mrs. Brown will send a memorandum to everyone and ask them to submit the following information on any presentations given: title, locations, date, and authorship.

A discussion about corporate support of the project beyond the September 30 date ensued. No formal information has been received from any company. Dr. Stachura recommended finding out from EAMC if there is interest in the military continuing beyond September 30.

Mr. Toler suggested looking at the MCG/GIT subcontract to see if any reports are necessary, which may include plans for next year. Dr. Stachura suggested getting together and preparing a plan for the meeting with the presidents of Georgia Tech and MCG. These two will find time at the telemedicine conference in Macon to discuss these plans.

Mr. Peifer stated they would like an agreement to demonstrate the system to two MCG Ophthalmologists, and EAMC would be included if they wish to come. Dr. Stachura indicated that once the project is over, the equipment will belong to the State of Georgia, and would want to state that it was developed by the three institutions.

The next meeting will be held on Monday, 8/26/96 at 1:30 pm.

Respectfully Submitted,

Ann Brown

9/04/96

DRAFT
Electronic House Call Project
Steering Committee Meeting
September 17, 1996
1:30 pm

The Steering Committee of the Electronic House Call Project met on Tuesday, September 17, 1996, at the Medical College of Georgia.

Members Present	**Institution**
Mrs. Laura Adams	Medical College of Georgia
Mr. Mike Burrow	Georgia Institute of Technology
Dr. Kevin Grigsby	Medical College of Georgia
Mr. John Peifer	Georgia Institute of Technology
Ms. Loretta Schlachta	Eisenhower Army Medical Center
Dr. Max Stachura	Medical College of Georgia
Mr. Jim Toler (via telephone)	Georgia Institute of Technology
Mr. Jack Horner (rep. by Ms. Jean Barnes)	Eisenhower Army Medical Center

Members Absent	**Institution**
Dr. Betsey Blakeslee	Eisenhower Army Medical Center
Dr. Dan Rahn	Medical College of Georgia
Dr. Dan Ward	Eisenhower Army Medical Center

Other Attendees: Ms. Ann Brown, (MCG), Ms. Patti Edwards, (MCG), Ms. Debbie Durham (MCG), Mr. Sam Panchal (GIT - via telephone), Dr. John Searle (MCG), Mr. Barry Sudduth (GIT- via telephone)

Welcome

Mr. Toler, Chairman, called the meeting to order. A quorum was present at the meeting. Mrs. Brown indicated that approval of the past four meetings' minutes was needed for record keeping. The group voted to approve the minutes with changes as submitted for the July 17, August 5, 12, and 19, 1996 meetings.

Mr. Toler reminded the Committee that the termination of research efforts will be on September 30, while the Final Report is due on October 31, 1996.

Ms. Schlachta asked if the Steering Committee had formally voted to close this phase of the program, i.e., an additional no-cost extension has not been discussed. Mr. Toler stated he did not realize this was an option at this point. Dr. Stachura stated he would like to repeat that General Xenakis, President Clough of GIT, and President Tedesco of MCG have pledged to continue to develop the EHC. Negotiations to make this happen are underway. The group discussed the idea of a no cost extension. If this were implemented, it would mean we could continue to collect data on patients and would change the report deadline. Each institution would have to pay its own way, and Jones InterCable would have to agree to support the connectivity during the

established time period. This would be one option, but does not change the question of how the continuation of the project will be funded. Ms. Schlachta added that this would enable the project to continue in the same mode if each institution will provide their own funds. Ms. Adams stated that she felt the Steering Committee has an obligation to meet the terms of the current agreement within the October time period, rather than using a no-cost extension to continue the project.

Ms. Schlachta pointed out that continuing would allow us to collect more data.

Mr. Toler asked that all the president and general be made aware of the opportunity for an extension. He stated that for Georgia Tech employees, no time can be charged to the Cooperative agreement 9 the funds have all been expended. He is not sure what purpose an extension would serve since the funds are gone.

Dr. Stachura said the spirit and intent of this would be clear, but the legality would be questionable.

<u>Report of the Technical Subcommittee</u>

Mr. Burrow reported that EAMC had 10 systems installed serving 12 patients and one system has been removed. Their total patients were 13 for the project. MCG has five installed systems serving 5 patients. 2 additional patients will participate who live at homes already installed. Three additional homes will be installed, and two more are under development. This will provide the total goal of 12 patients for MCG.

Operational Status - Two patients: Patient #9 and patient #13 should be working now. There was a problem with the video at patient #13's home. This problem has been corrected. Patient #9's system is turned off. They need to be contacted to test the system. Mr. Toler asked if this was a similar situation with patient #2's. All the hardware has been replaced, Harry Hess of Jones InterCable has worked on the system and does not know what to do at this point. They are able to make connections, but get frozen images and can take vital signs.

Mr. Schlachta stated a distinction between patient #2 and patient #9. He was the first patient consented for EHC and they believe they have lost his cooperation because of the lengthy time associated with getting the system working. Mr. Panchal asked if the current connection is as good as patient #2's system will produce, is it good enough quality to collect data. Mrs. Barnes responded that she gets minimal vital signs which could be gathered. Mr. Hess is being kept apprised of this situation.

Mrs. Barnes stated this is the first time she has heard patient #9's home declared "working." She will meet with him to train him.

Mr. Burrow mentioned a problem with the ISDN lines and there is some new software. They have had some problems in adding patients and the new software causes the system to crash. By the end of the week they will have the solution and will upgrade the CMS next week.

Mr. Panchal reminded the nurses that when you delete a patient it causes this type of problem.

The question of installing additional systems due to the short period of time before the September 30 deadline was discussed. Jones Intercable has been informed of the homes that need to be installed, but their work is going slowly. Ms. Schlachta asked if their had been any communication from Jones' office in Denver to the Augusta office. Mr. Toler stated that he had a conversation with Charlie Raley, a Jones Intercable Vice President in Denver. He feels the Augusta activities are important and upper management wants to continue to participate in this project and wants to do all they can to support this. He was to get back with Mr. Toler after speaking with Mr. Neil Sullivan, Vice President for Operations. Ms. Schlachta asked if Denver has spoken with the local Jones people about continuing. Dr. Stachura said the people in Augusta are reluctant to say what decisions have been made.

Mr. Burrow reminded the group that when they ask about operational status of the system, you must ask about a specific date and time. When we talk about Phase Two of the project, it needs to be further defined. He hopes Jones Intercable will assist in acquiring upgraded equipment. Dr. Stachura commented that this would be new modems, etc.

Mr. Peifer stated that Broadband technology group offered their services to characterize the noise. Mr. Burrow added that they offered to come and provide guidance on frequencies. This had been mentioned to Mr. Harry Hess of Jones Intercable, but he was not agreeable to "opening up" their system to anyone else. Mr. Burrow still believes this would be valuable to recognizing the problems in the network. He suggested offering these services to the Jones Intercable officials in Denver.

Ms. Schlachta asked to be contacted regarding the outcomes of conversations with Jones' officials so she may report to General Xenakis.

<u>Clinical Subcommittee:</u>
Dr. Stachura stated he wanted to expand the nursing home patients to make use of the connections. Dr. Jackson has only initiated one call and he wants to supplement this by separate nursing home visits conducted by Debbie.

Ms. Schlachta stated that EAMC would like the current system to remain and would like to have additional 3 systems at EAMC.

Dr. Stachura indicated that how the three institutions proceed after October 1 will impact the

future of the project. He said that MCG and EAMC may want to do different things with their patients. He continued to remark that once the cooperative agreement ends, the report will be written, and a decision will have to be made what the three groups wish to do.

Evaluation Subcommittee:
Dr. Grigsby suggested several standards for development of the final report. He would like everyone to use Word Perfect, to send all components to Kevin by noon on October 14. The format of the report will be coming from Fort Detrick. Dates will be circulated for due dates on various components of the report which will be assigned. He also needs signed copies of the forms as well as C.V.s for the authors of the abstract of the ATA Annual Conference to be held April 3-6 in Atlanta. He will need these by September 27.

Review of Efforts to Secure Funding for Phase 2
Corporate and other funding sources were discussed. Ms. Schlachta indicated that Sprint's Vice president wants to come to see the EHC to consider expanding connectivity to the telephone. AT&T will come next Wednesday to EAMC to discuss their "Lifecare System." Also, Col. Gilbert is studying a Navy sonar device for monitoring divers and believes this might be a potential for integrating with the EHC.

The meeting was adjourned at 3:05 pm. The next meeting will be held on September 24, 1996 at 1:30 pm.

Respectfully Submitted,

Ann Brown

10/17/96

DRAFT
Electronic House Call Project
Steering Committee Meeting
September 24, 1996
1:30 pm

The Steering Committee of the Electronic House Call Project met on Tuesday, September 17, 1996, at the Medical College of Georgia.

Members Present	**Institution**
Mr. Mike Burrow	Georgia Institute of Technology
Dr. Kevin Grigsby	Medical College of Georgia
Mr. Jack Horner	Eisenhower Army Medical Center
Mr. John Peifer	Georgia Institute of Technology
Ms. Loretta Schlachta	Eisenhower Army Medical Center
Dr. Max Stachura	Medical College of Georgia
Mr. Jim Toler	Georgia Institute of Technology

Members Absent	**Institution**
Mrs. Laura Adams	Medical College of Georgia
Dr. Betsey Blakeslee	Eisenhower Army Medical Center
Dr. Dan Rahn	Medical College of Georgia
Dr. Dan Ward	Eisenhower Army Medical Center

Other Attendees: Ms. Ann Brown, (MCG), Ms. Jean Barnes (EAMC)

Welcome

Mr. Toler, Chairman, called the meeting to order. A quorum was present at the meeting. He suggested an agenda of discussing upcoming installations. Dr. Stachura suggested declaring formally what we think is happening with respect to the continuation of the project.

Dr. Stachura summarized that the Cooperative Agreement terminates on September 30. That deadline will stand. The report is due October 31. The report consists of data about using the machines. Although the termination date is September 30, we will continue to accumulate data through October. All equipment will continue servicing current patients. Data will be collected and shared. The question of who owns the equipment remains. We could allow a continuance of the equipment and sharing of the data. "Phased" return of the equipment to MCG will probably be the way it is handled.

If a corporate sponsor wished to pay for another arrangement, we would have an escape clause. Each clinical site would retain responsibility for technical support. The cost of technical support will be borne by that institution. MCG would like to contract with GIT for technical support.

EAMC will keep their equipment through October and will begin a phased return to MCG.

Legally, EAMC may own the equipment. This plan will give the lawyers time to decide who owns the equipment.

Mr. Toler asked the EAMC representatives if this is what the military wants to do. Mr. Horner stated that they want to gather more data and keep the patients who are currently installed.

Mr. Burrow asked how the current technical support could go on. Mr. Toler stated that a contractual arrangement would work but would possibly take a long time to set up. It seems that GIT would be out of the operation of the project other than providing technical support.

Mr. Peifer asked if the project was successful in gaining corporate sponsorship how would this impact patients and so forth if they need to get the units out of their homes quickly.

Mr. Horner stated that all members of the partnership would suffer from the loss of data, etc. He stated this is a difficult question to answer. Ms. Schlachta added that it may turn out that EAMC owns half of the equipment.

Mr. Toler asked if there had been an update on the legal ruling for the equipment ownership. Dr. Stachura indicated that he does not yet know the final result.

Mr. Toler stated that he is not in a position to speak for GIT, but they believe Tech bought the equipment using GRA funds so Tech owns the equipment. Their legal office will be asking where the equipment will be located. He added they will continue to proceed with sponsorship for the project.

Mr. Horner added that if there is a requirement for a leasing agreement, EAMC may not have a legal right to use the equipment. Dr. Stachura explained that within the cooperative agreement, EAMC has an unconditional right to lease the equipment.

Mr. Peifer explained that under intellectual property rights, maintaining the right to use software is different from the right to use or lease the equipment.

Ms. Schlachta asked if the informed consent must be replaced or extended in order to continue seeing patients. Dr. Stachura responded that MCG patients would not be able to be seen beyond the end of the cooperative agreement.

EAMC would be able to fund Jean Barnes' salary themselves, even under a no-cost time extension. Georgia Tech would be "locked out" under an extension.

Dr. Stachura asked that a no-cost time extension not be considered at this meeting; however, each institution will have a designated person (Dr. Stachura, Mr. Horner, and Mr. Toler) to

pursue this within the next 48 hours and decide how to best proceed. This group will conduct a telephone conference tomorrow around 4:00 pm to determine the next step.

Even under an extension, MCG can see no more patients unless the Human Assurances Committee gives and extension. EAMC can see patients under their current consents.

The last word from Jones InterCable was that they do not plan to continue beyond January 1 and they are not sure beyond September 30. Ms. Schlachta relayed a conversation she had with Jones and they said they were not inclined to install new systems but were willing to support those currently installed.

Dr. Grigsby mentioned the abstracts for the ATA for this project have been faxed to GIT. There will be one representative from each location going to participate in the presentation: Ms. Schlachta, Mr. Burrow, and Dr. Grigsby.

Respectfully Submitted,

Ann Brown

10/23/96

APPENDIX D

Proof of Concept and System Demonstration

Background

The technical goal of Task 2 was to develop a stand-alone telemedicine system and associated network for monitoring the health of home-bound patients via telecommunications links. The system had to allow patients to communicate audiovisually with a medical care provider as well as perform unassisted diagnostic measurements. Many telemedicine projects are currently underway which link tertiary care facilities with primary care physicians in remote, usually rural, locations. The Electronic House Call (EHC) system represents an extension of that model placing the point of care in the patient's home. It is hoped that this method of managing health care will allow for more widespread access to quality care, reduce the need for emergency care through preventive medicine, and allow patients to return home sooner after being hospitalized.

The requirement to monitor patients at home presented many technical challenges. The first and foremost challenge was to develop a flexible system capable of being used by individuals with varying educational levels, age, economic status, etc. This placed severe constraints on the user interface in particular and on the overall sophistication of the system in general. These limitations related to how the patient will interact with medical instrumentation and the system as a whole. Another challenge was to develop a system capable of reaching the greatest number of patients in their homes. Such a requirement called for a system capable of operating over various telecommunications media such as POTS, CATV, and ISDN in a wired or wireless mode. The EHC system uses both CATV, provided by Jones Intercable serving the Augusta, Georgia area, and ISDN, provided by BellSouth, to link patient homes with care providers at the Medical College of Georgia (MCG) and the Eisenhower Army Medical Center (EAMC).

The technical subcommittee formulated an approach for meeting these challenges early in the project. This approach consisted of the following tasks:

- Define system requirements for monitoring patients at home
- Perform an extensive survey of commercial telemedicine/teleconferencing systems and diagnostic devices to identify existing technology that can meet the needs of the project
- Formulate and implement a network plan to link patients with medical care providers
- Modify an existing system or develop a telemedicine system for home monitoring
- Install systems in the homes of 12 patients and a nursing home and evaluate performance
- Modify the system based on feedback from evaluations
- Install modified system in the homes of 13 additional patients

The following paragraphs discuss in detail efforts on each of these tasks.

System Requirements

The technical subcommittee met with consortium members at the outset of the project to define functional requirements of a system that would monitor patient vital signs in their homes. These requirements were addressed on a system level and specific physiological parameters to be

measured were ignored. The goal was to establish a list of requirements by which commercial teleconferencing/telemedicine systems could be evaluated for meeting the needs of this project and to guide subsequent modification/development efforts.

The first requirement was that the patient must be capable of audio-visual communication with the care provider. A desirable feature of the system was to achieve full motion (30 frames/second) video while maintaining good audio quality. It was agreed that some motion quality could be sacrificed, possibly as low as 15 frames/second, but that good audio quality must be maintained. This requirement necessitated investigating high bandwidth communication links; however, such pathways do not currently exist among the general population. In the initial review of commercial systems, the ideal performance requirement of low bandwidth with high video frame rates and good quality audio was sought after. Subsequent investigations revealed that a high bandwidth link can be obtained into a large number of homes via CATV and RF Modems allowing the low-bandwidth constraint to be relaxed.

A second requirement was that the system conform to industry standards such that communication links could be established with equipment from many vendors. As telemedicine systems become more widespread, the ability to communicate across vendor boundaries will become critical. Many vendors of teleconferencing equipment support both a proprietary and a standards-based mode. Typically, a proprietary mode offers greater performance due to the fact that technology quickly surpasses standards. All of the telemedicine systems we reviewed specifically for home applications operate in a proprietary mode. This requires that the same equipment exist at all locations.

The third requirement centered around a patient database at a Central Monitoring Station (CMS). The CMS system must be capable of storing patient information, allowing recall of that information, and providing trend data. The ability for patients using the EHC system to perform unassisted vital signs measurements on a routine schedule prescribed by a medical care provider was key to the project. This information should be captured locally and transferred to a CMS for computing trends and statistics on the patient data. A desirable feature of the system was that this data capture and transfer be performed automatically without intervention from a medical care provider. Many research programs have been funded and are currently underway to develop a comprehensive electronic patient record. It was not our intent to parallel the efforts of others by developing a comprehensive patient record, but to provide some rudimentary tools for capturing patient information from measurements made at home using the EHC system. A comprehensive electronic patient record must be an integral component of the EHC system in the future and subsequent database development will be performed in collaboration with entities currently being funded to address this need.

A fourth requirement was that the system must be capable of performing diagnostic measurements, recording that information, and transferring it to the CMS. In reviewing commercial telemedicine systems, very few were found that support the measurement of more than two physiological parameters. Typically, these systems supported blood pressure measurement and heart and lung sounds. Even fewer commercial systems were capable of automatically collecting that information and transferring it to a CMS. Initial investigations were not concerned with which parameters were required for monitoring patients under this project, but focused on determining capabilities of commercial systems. At a later date, clinicians identified patient populations that would be monitored under this project and an associated set of physiological parameters to be monitored. The parameters were prioritized based on clinical needs and ease of interface with a computer-based telemedicine system. The first six parameters, which were subsequently

incorporated into the system, were:

- Blood Pressure and Heart Rate,
- Heart and Lung Sounds (Electronic Stethoscope),
- Pulse Oximetry,
- Temperature,
- Electrocardiogram,
- Weight.

A second set of parameters were identified which will be included in Phase II enhancements of the system. These are

- Spirometry,
- Blood Chemistry,
- Doppler Ultrasound.

The fifth requirement involved home-bound patient education. It was determined that the system should be capable of allowing patients to access medical information. Ideally, this would be patient specific information; however, access to general information on illnesses, injuries, treatment, medication, etc. was targeted initially. This has been accomplished in the current EHC system by incorporating a commercial CD-ROM designed for home health care - AMA Family Medical Guide. Since the telecommunications link into the home accommodates data as well as audio and video, patient specific information (text and/or video clips) could be downloaded to a telemedicine system for later review by the patient. As will be discussed later, the network configuration and communications protocols chosen for this project allow access to medical information through the Information Superhighway; however, this capability has not been implemented in the current EHC system. Information available on the World Wide Web (WWW), while in many cases is not user friendly, can provide patients with medical resources and support group services not previously available. Phase II developments will take advantage of the WWW by establishing customized interactive Web pages that patients can access.

A sixth requirement was the ability to capture an image and to control the camera at the remote site. The ability to capture an image, transfer it to the CMS, and store it in a patient record for subsequent recall allows physicians to objectively evaluate a patient's progress. The ability to perform this function requires that a data path be established between the CMS and the patient site. Another advantage gained by taking a still image is that the image can be displayed at the CMS with greater resolution than the live image. This is due to the fact that the image is captured at the patient site before undergoing compression which generally degrades the image. Remote camera control is a feature that few commercial system offer. It was agreed that a desirable feature of the system was to allow the care provider at the CMS to control the camera (pan, tilt, zoom) at the

patient site.

The seventh requirement identified was a simple, graphical user interface. The method in which the patients interact with the system had to be simple and intuitive. Patients using this system could range in age from small children to the elderly. In reviewing commercial systems, much emphasis was placed on how the patient would actually control the system. It was felt that a patient could not be required to use a mouse or keyboard to interact with the system. The final system configuration incorporates a touch screen monitor allowing the patient to interact with the system via touch. In addition, the diagnostic instrumentation chosen for this application had to be manageable by an unattended patient.

The eighth and final requirement involved multi-point conferencing for the purpose of developing support groups for patients with common illnesses. In this scenario, patients could not only place an audiovisual call to their care provider, but could also call anyone else to whom they had authorization to connect. It was agreed that while this feature was highly desirable, it was not essential for the initial project. Recent developments by Intel in their ProShare videoconferencing system allows for multi-point connectivity. The requirement of allowing patients the ability to form "support groups" through multi-point conferencing will be address in Phase II.

These eight requirements were used in evaluating commercial products for use in the EHC project. As will be shown later, the consortium agreed to develop a custom telemedicine system as no suitable commercial system could be found that would be available in the time-frame of this project. The above requirements have been used as a guide in developing the EHC telemedicine system.

Systems Survey

Telemedicine/Videoconferencing Systems

An extensive survey of commercial telemedicine/videoconferencing systems was conducted in collaboration with representatives from the Medical College of Georgia (MCG) and Eisenhower Army Medical Center (EAMC). The initial focus was on telemedicine systems currently being used to monitor individuals in their homes. Three systems were evaluated through demonstrations and/or presentations at MCG and at EAMC - Health Tech Services, Corp. (HANC), H.E.L.P. Innovations, LC (Resource Link) and American Telecare, Inc. (PTS100S). Subsequently, five teleconferencing systems were evaluated to determine if the audiovisual capabilities could be integrated into a telemedicine system - VTEL, Inc. (DeskMax), Data Point, Inc. (MINX 2000), AT&T (Picasso), MD/TV (Housecall), and British Telecom (VC7000 and VC8000). Since these teleconferencing systems were not designed for telemedicine applications, many of the requirements listed above were not met. It was determined that if one of these systems were deemed appropriate for the EHC project, it would have to be modified substantially. Therefore, initial emphasis was placed on a thorough evaluation of the three systems designed specifically for telemedicine. The results of these investigations are provided on pages D-32 though D-39.

As expected, none of the telemedicine systems evaluated provided the full range of capabilities needed for the Electronic House Calls Project. The Resource Link system allowed for high bandwidth audio and video, but did not provide a data path for transmitting diagnostic information to the CMS. This is the only other tele-home care system utilizing CATV as its communications medium. The PTS100S system by American Telecare used analog phone lines (POTS) and therefore the video quality was poor. An MCI picture-phone, with a miniature screen,

was used in this system. A larger 11" screen has been developed and integrated into the picture-phone; however, the image is still poor. The PTS100S was capable of monitoring blood pressure and heart sounds but required two analog phone lines - one for the picture-phone and one for the electronic stethoscope. In addition, a long lead time was required to transfer information from the patient site to the CMS.

The HANC system came the closest to meeting our requirements for the project. This computer-based system was capable of monitoring blood pressure, heart and lung sounds, EKG, and temperature. It utilized analog phone lines to transfer audio, video and data between the patient site and the CMS. Consequently, the video was extremely slow (approximately 3-5 frames/second) and the time required to transfer a "snap-shot" image was long. Although the system did not meet all of our requirements, it was felt that Health Tech, Inc. offered a platform from which to build a system for this project. Health Tech representatives indicated that HANC systems would be available for this project if a suitable collaborative working arrangement could be reached.

The technical subcommittee provided a recommendation, as reflected in the section on pages D-32 through D-39, based on results of the evaluation of commercial telemedicine systems and the fact that CATV was to be the telecommunications link. In summary, the recommendation was to develop a collaborative relationship with Health Tech (computer-based home-bound patient monitoring system) and H.E.L.P. Innovations (CATV audiovisual telemedicine system) to merge technologies in the development of a telemedicine system utilizing CATV with good quality audio and video, monitoring and recording vital signs as identified above, and transferring that information to a CMS. Subsequent efforts in pursuing this arrangement revealed that Health Tech would not be in a position to begin manufacturing the HANC system until March, 1996. No firm commitment was given regarding delivery of 25 systems needed for this project. It was later learned that the HANC system would not be manufactured until the Fall of 1996. It is still not known if this system is available commercially. In addition, the Resource Link system used CATV in a manner which did not allow transfer of digital data and plans to achieve this functionality were deemed inadequate. As a result, the technical subcommittee began investigating the possibility of developing a custom telemedicine system which could be prototyped rapidly for deployment into patient homes.

The potential of utilizing CATV in conjunction with RF modems (see next section for a detailed description) providing digital access at bandwidths never before achieved into the home steered the investigation toward videoconferencing systems which support a LAN TCP/IP and/or UDP environment. As a result, research staff focused on two videoconferencing systems for integration into a custom telemedicine system - Virtual Desk (ImageLink, Inc.) and Proshare (Intel, Inc.). Both of these system support ISDN and an Ethernet LAN environment. A meeting was scheduled in which representatives from the clinical subcommittee reviewed the two systems and a final decision was made to utilize the Intel Proshare videoconferencing system in developing a telemedicine system for the EHC project.

Medical Diagnostic Devices

Clinical investigators on the project provided a list of six physiological parameters that must be monitored during Phase I of the project. These included Blood Pressure and Heart Rate, Heart and Lung Sounds (Electronic Stethoscope), Pulse Oximetry, Temperature, Electrocardiogram, and Weight. The technical subcommittee began investigating medical devices which will monitor these physiological parameters and that will also interface with a computer-based telemedicine system.

Two approaches were investigated - a component level approach which utilized low-cost medical devices developed for home monitoring and a system approach which consisted of hospital-grade equipment capable of monitoring multiple parameters in one unit.

Several medical devices were obtained and evaluated under each category as listed below.

Component Level Approach

- LifeWatch - Ralin Medical
- Onyx - Nonin
- Palco/8500 - Nonin
- Dynapulse
- ThermoScan
- Electronic Stethoscope - Andrias Tek
- Stethocom II - MTI
- TelePhonic Stethoscope - American Telecare

System Level Approach

- Dynamap - Johnson & Johnson
- Eagle 3000 - Marquette
- Criticare

From a technical perspective, each device was evaluated with regard to how easily it could be integrated into a computer-based system and how much control over the device could be achieved. As envisioned, the patient would activate the monitoring device by selecting options on a computer screen. This required that each medical device have a method of communicating with the computer such that the computer can initiate a measurement. In addition, a data path from the medical device to the computer was required to allow for parameters to be accessed and recorded. While automatic initiation of a measurement as well as transferring and storing the data was a highly desirable feature, it was determined that some parameters could be measured without a link to the computer. For example, temperature and weight could be measured and the resultant value entered via a large on-screen keypad or simply held up to the camera for the care provider at the CMS to record. The final system configuration relies on this method of measurement for the patient's weight only.

Clinicians also identified three additional parameters, as listed in the previous section, which were desirable but not essential in Phase I. Researchers obtained information on several spirometers and one blood chemistry analyzer which were felt to be candidates for the EHC project. One of the spirometers is equipped with a serial port for interfacing with a computer. As a result, this device could be added to the system in the future without much difficulty. The I-STAT system, used for analyzing blood chemistry, was evaluated and found to be relatively difficult to use. It requires the patient to collect a small sample of blood to be deposited into a cartridge. Questions arose as to whether patients could be expected to perform this procedure unattended at home. Nevertheless, the I-STAT system was the most user friendly blood chemistry analyzer commercially available. A serial port connects to a wireless transmitter for sending data to a central computer. With some modifications, it is believed that this device could be incorporated into the system during Phase II.

A project review meeting was held on November 29, 1995 in which clinical representatives were provided an opportunity to evaluate all of the medical devices obtained by the technical subcommittee as well as to review the videoconferencing capabilities being considered for inclusion in the EHC telemedicine system. Following the demonstration, the committee finalized the configuration of the telemedicine system that was to be constructed for the EHC project. The consortium decided to integrate the Intel ProShare videoconferencing system into the EHC product and to pursue the system approach to monitoring physiological parameters. A copy of the slides

presented at this meeting is provided on pages D-40 and D-41. The last slide summarizes the system configuration as agreed upon at this meeting. A more detailed description of the system is provided in the section entitled system development.

Network

Design and Implementation

One of the most challenging technical aspects of this project was defining and implementing a network capable of connecting patient homes with the Medical College of Georgia and Eisenhower Army Medical Center. The network had to be capable of handling audio, video and data with a quality that is acceptable from a medical diagnostic perspective as well as being widely distributed to reach a large population. As the investigation of network possibilities progressed, it became clear that ISDN into patient homes was an expensive route and that many areas are not served by ISDN. CATV presented an attractive solution in that it could be used to reach a larger population; however, the technology for setting up a data network over CATV is relatively new.

The potential benefits obtained by establishing a wide area ethernet network running TCP/IP and UDP over CATV became evident as researchers became more familiar with this technology. RF modems can be used to establish a “10 Mbps” Ethernet link into the home over CATV. This bi-directional, wide bandwidth, data path into the home has not been possible at a reasonable cost until recently. In addition to providing a large bandwidth link into the home for video, audio, and data, the fact that ethernet is being used allows patients to access the Internet from home given that one of the nodes (MCG, Jones Intercable, or EAMC) has a link to the Internet. This opens possibilities for patient education and medical services to be provided through WWW pages.

The first objective was to test the network concept by establishing a test site. Jones Intercable configured CATV lines between Dr. John Searle’s home and his laboratory at MCG to accommodate ethernet using Digital Equipment Corporation (DEC) RF modems which have a theoretical data transfer rate of 10 Mbps. A spectrum analyzer was used to determine the “quietest” frequencies for transmission and reverse amplifiers were installed along the CATV run servicing Dr. Searle’s home and MCG. The node at MCG was configured as a link into the Biomedical Engineering (BME) file server and through the MCG campus network to the Internet. A test was conducted in late October in which Dr. Searle attempted to connected a computer at his home to the BME file server using the RF modems and CATV lines. This test was not successful, and after three weeks of effort to solve the problem, it was determined that a link could not be established using the DEC RF modems.

Subsequently, the Digital Equipment RF Modems were replaced with Zenith Home Works Universal RF modems (LANHWU-4M) providing a reduced theoretical data transfer rate of 4Mbps. During several weeks of monitoring, the data transfer rate varied considerably due to problems with the stability and reliability of the CATV components. The reduced bandwidth of the Zenith modems compared with the DEC modems was not a factor in Phase I of the project because Intel ProShare limits the bandwidth of their videoconferencing system to either 200 Kbps or 400 Kbps and a private network is being used in which only two patients were allowed to connect at any time. Additional tests were conducted between Dr. Searle’s home and his laboratory in which timed file transfers were performed to determine a practical throughput over the CATV ethernet. The maximum effective throughput was determined to be approximately 800 Kbps which is consistent with transfer rates observed on internal ethernet networks at MCG and Georgia Tech.

A test in which two video conferencing systems were linked over the CATV Ethernet network was conducted in late November. Intel ProShare systems were installed in Dr. Searle's home and his laboratory at MCG. A videoconferencing test was performed over the CATV link with satisfactory results. There appeared to be no difference in video and audio quality as compared with tests performed in a laboratory at Georgia Tech over the campus ethernet. Subsequently, the Intel ProShare systems were replaced with ImageLink systems and the test was again performed with satisfactory results. The audio and video quality of the ImageLink system was better than that observed with the Intel systems most likely due to the fact that ImageLink does not limit their upper bandwidth to 400Kbps as Intel does. It was agreed that either system could be used for the EHC project. In addition, it appeared that a stable ethernet CATV solution could be realized for this project; therefore, subsequent network design strategies focused on this approach.

The next step was to design a network for serving 25 patients, a nursing home, the nursing home director's home (Dr. Jackson), two CMS units at MCG, and a CMS unit at EAMC. Although it was not necessary to select patients who currently have CATV service (Jones Intercable installed CATV in those houses that were not currently served), it was necessary to select patients in Jones Intercable Hub 0 service area. This was due to the additional cost and effort that would be required to outfit another head-end to accommodate ethernet CATV. A map of Jones Intercable Hub 0 was provided to the clinical subcommittee and it was agreed that for Phase I of this project, civilian and military patients in Hub 0 would be identified.

A complication arose in providing service to Dr. Jackson's home, the Westlake nursing home, and the CMS at EAMC because these sites reside outside of Jones Intercable Hub 0. Jones Intercable agreed to extend the RF ethernet over CATV to Dr. Jackson's home and the nursing home, which are both located within Hub 1 in Martinez, GA. An investigation into providing service to EAMC was conducted with an initial focus on providing a fiber link to the ethernet CATV network. A backup plan was also investigated in which ISDN lines would be used to connect EAMC to the network. After several weeks of investigation, it was determined that a fiber link to EAMC was too costly (~$40,000) and no commitment could be obtained from Jones Intercable to cover the cost of the fiber. The ISDN solution became the preferred method of connection and the process of installing lines at MCG was started. Three ISDN lines were installed at MCG while existing ISDN lines at EAMC were utilized. EAMC installed two Ascend Pipeline 400 BRI Inverse Multiplexors with ethernet support at MCG and EAMC. This provided the capability of running TCP/IP and UDP over a 384Kbps link between MCG and EAMC. Since Intel ProShare limits their videoconferencing upper bandwidth to 400Kbps, it was felt that a bandwidth of 384Kbps would not noticeably affect the audio and video quality. Two network diagrams are provided on pages D-43 and D-44. The first diagram represents a top level view of the physical network used for the EHC project while the second diagram provides a detailed overview of the network including IP addresses for the Zenith Home Works boxes and the EHC stations.

The first two installations were performed on February 26-27, 1996 within the Jones Intercable Hub 0 service area. Subsequent use of the system revealed that the network was highly susceptible to noise and fluctuations in signal levels. An investigation ensued to determine the cause of this interference and to stabilize the signal levels. A number of factors contributed to problems with the CATV network. Since this is leading edge technology, there is very little experience in the use of RF modems to establish an ethernet network over a CATV system. There are a number of pilot projects underway in which this technology is being used; however, to our knowledge, this is the only application that is attempting to perform videoconferencing over such a network. Compared to a conventional remote terminal access (Telnet) or file transfer (FTP) application, a

videoconferencing application demands extremely low packet transmission delay and error rate. As a general rule, videoconferencing on a packet network requires pristine conditions to function properly.

Ingress Noise

Many articles have been published in recent months which describe difficulties encountered when implementing LANs over the cable network. The most serious of these problems is the entry of ingress noise into the system. Cable networks traditionally have a tree topology with the head-end being the trunk. The network branches as the distance from the head-end and number of customers increase. In the reverse path, each branch location represents a summing node for signals headed upstream. As a result, noise conducted or coupled from the home into the reverse channel will be amplified and transmitted in the cable network. This noise causes the cable modem to behave as if the RF channel were unavailable. When the channel is not free, the modem will wait and try transmitting later. This method of retrying is unacceptable for real time data such as video packets. This problem manifests itself by the inability to receive video from the machine which transmits on the reverse channel (i.e. patient to nurse video traffic). There were numerous times during the project when a patient would be able to see and hear the nurse at the hospital, but the nurse would only be able to hear the patient with either no video or frozen video.

Ingress noise is difficult to measure due to the fact that it is typically bursty. As a result, a spectrum analyzer will indicate that a particular frequency is noise free, when in fact short bursts of noise are constantly on the network. These short bursts of noise, if of sufficient amplitude and duration, will collide with and destroy data packets. A method of quantifying the amount of noise on the network was devised and implemented. An RF modem was reverse engineered to extract the signal before and after processing. A filter was constructed to extract signals on the network which were less than 1.2us in duration and greater than 0.8 volts peak-to-peak. This filter allowed us to distinguish ingress noise from valid data since data packets are of longer duration. The goal was to identify bursty ingress noise capable of destroying valid data packets. When a burst of noise was detected by the filter, a signal was sent to a chart recorder which continuously recorded the number of bursts per second (see pages D-84 through D-98). Isolated incidents of high activity were manifest by spikes on the chart recorder. While a relationship could be observed between the amount of ingress noise and the success or failure of a videoconference, no trends could be established in which ingress noise was expected to present. It was discovered that noise bursts usually occurred synchronously within 20 degrees of a zero crossing of the utility power. The sporadic and unpredictable nature of this interference made it impossible to isolate a source because the process would have required assigning service personnel to remain in the field ready to selectively disable return path segments at a moment's notice. An alternative diagnostic process was to disable selected portions of the return path installation while monitoring over a period of several days, but this method was rejected because it would have rendered those portions of the network inoperable for the length of each test.

While there exists expertise within Jones Intercable on RF modem technology, their experience is limited to applications outside videoconferencing. A two-day "workshop" was held on May 2-3, 1996 in which a Jones Intercable representative discussed the current state of the technology and the problems one could expect to encounter. Outside of acknowledging that ingress noise is a problem and that newer technology is becoming available which may be able to coexist with this noise, no concrete solutions were provided to address the immediate needs of the project.

Signal Levels

Reverse channel signal levels were another source of difficulty in realizing a stable network. It was observed that these signal levels would vary with the time of day and weather conditions. A method for measuring the return signal level from each home was devised and implemented. A query to a specific RF modem at a patient location returned acknowledgment packets to the MCG lab. A storage oscilloscope attached to a modified modem captured valid data packets captured the signal waveform so that an amplitude measurement could be taken. These measurements were performed at all patient sites four times daily (see pages D-52 through D-83). By long-term observation, it was determined that if the signal level dropped below 0.8 V peak-to-peak, then the chances of performing a successful videoconference were slim. As a result, the network was monitored and modified to maintain all reverse channel signal levels between 0.9 V and 1.5 V.

The problem of ingress noise has been identified by both the cable companies and the cable modem manufacturers and is being addressed in the next generation of equipment and cable plant design. Nevertheless, this problem was one that could not be solved within the context of the EHC project but was instead managed to mitigate its effects. Also, within the requirements of the project, there could be a maximum of four simultaneous EHC consultations - one each from the MCG hospital, EAMC, the nursing home director, and the MCG lab. A schedule was developed such that only a single consultation would be in progress at any one time. This eliminated the chance that simultaneous conferences would negatively influence the network performance. In addition, a schedule was established in which the nurses were allowed to make patient calls during the morning and early afternoon while Jones Intercable performed maintenance and installation work during the late afternoon hours. Jones Intercable addressed signal level problems as they were reported and installed reverse amplifiers and in-home wiring at new patient sites as they were identified by the clinical committee. The goal of monitoring 25 patients specified in the Cooperative Agreement was met with fewer than 25 site installations because multiple patients were accessible at some sites.

Protocol Issues

Protocols used for videoconferencing applications when combined with protocols used by RF modems compounded problems encountered with ingress noise. The Zenith HomeWorks modems are designed to buffer information and transmit in a First-In-First-Out fashion over the CATV network. If a modem detects a collision indicating that the packet is not successfully translated from the reverse to the forward channel, then the modem will retransmit up to 16 times. During the time that the modem is retransmitting data, the buffer is placed on hold such that no new data may enter.

The Intel Proshare videoconferencing system uses the universal datagram protocol (UDP) to transmit data between conferencing sites. Unlike the TCP/IP protocol, the UDP protocol does not require an acknowledgment to the sending site that a packet has been successfully received. The sending unit simply transmits packet after packet without regard for whether that packet successfully reached its destination. This protocol is used frequently in videoconferencing applications since the data is time sensitive and it does not make sense to retransmit packets that are old. In the time required to retransmit a video packet, the decompression algorithm has discarded that video frame and is decoding the next one, and in the case of a missed audio packet, the audio decoder must mute whenever the waveform data is missing so that the audio stream as a whole remains coherent.

If a packet comprising an audio or video stream is destroyed during transmission, the receiving system simply ignores that packet. A missed audio packet causes greater disruption to audio perception than a missed video packet does to the perception of video. A series of brief audio losses may easily render speech unintelligible whereas the loss of few video frames at odd intervals does not significantly degrade visual perception. In other words, a lost video packet is easier to conceal than a lost audio packet.

Since the RF modem is programmed to re-send data when a transmission error is detected, then if there is significant interference on the network, the RF modem will retransmit practically every packet that it receives. This causes the data received from Proshare to overflow the modem input buffer. The end result is that old data is discarded at the receiving site while current data is lost at the sending site as it waits to be sent. A situation can exist in which the videoconference algorithms fail to recover once about 0.5 percent of packets are lost or are late arriving. Researchers discussed the problem with Zenith engineers and asked them to modify the modem software so that it would not retransmit UDP packets; however, there was little interest on Zenith's part to perform this modification. Their engineering staff were focused on development of the next generation of modems and were unwilling to modify the current generation of RF modems for this project.

Summary

While a pristine network environment was never realized during Phase I of the project, the network problems were successfully managed such that the nurses were able to videoconference with their patients in most cases. The network is still susceptible to ingress noise which occasionally will render the network unusable. In addition, fluctuations in the signal levels as a result of weather conditions will cause the network to be unusable. These problems are being managed on an on-going basis by Jones Intercable personnel.

Each Electronic House Call system is provided with a unique IP address and system number. This unique IP address allows the use of TCP/IP and UPD as transport protocols on an ethernet network. It uniquely identifies each patient and directs the videoconferencing call to the appropriate CMS. The system number and associated IP address allows remote software management from the MCG laboratory or any other site on the network.

Subsequent efforts in Phase II will focus on deploying the next generation cable modem equipment which will handle the problem of ingress noise more efficiently. Frequency hopping capabilities combined with continuous monitoring of the network for "clean" channels on which to transmit should result in better performance, but videoconferecing applications are still likely to cause unforeseen problems which will need to be addressed by cable modem providers and/or manufacturers of videoconferencing equipment.

System Development

Hardware

The consortium agreed to develop a custom computer-based telemedicine system after an extensive search of commercial home telemedicine systems revealed that there was no system which could meet the goals of the project. It was also agreed that the Intel ProShare videoconferencing system would be used for videoconferencing and that the Johnson & Johnson Dynamap system would be used to monitor physiological parameters. It was felt that the hospital grade monitoring

equipment was much more reliable than the component based approach which consisted of low-cost devices for patient use. There was concern that some of the component systems were not acceptable for diagnostic purposes and questions arose regarding FDA approval of these devices.

The technical subcommittee began developing a system which would integrate these components, provide network functionality, and provide the patient with a turn-key medical monitoring solution. The final system configuration is shown in the block diagram provided on page D-44. It was agreed that a high performance prototype system would be developed with little regard to the initial cost. Subsequent development efforts will focus on providing acceptable functionality while reducing the cost of the system. As technology improves, the cost will naturally come down; however, there many avenues for cutting cost particularly if collaborative arrangement can be established with component vendors.

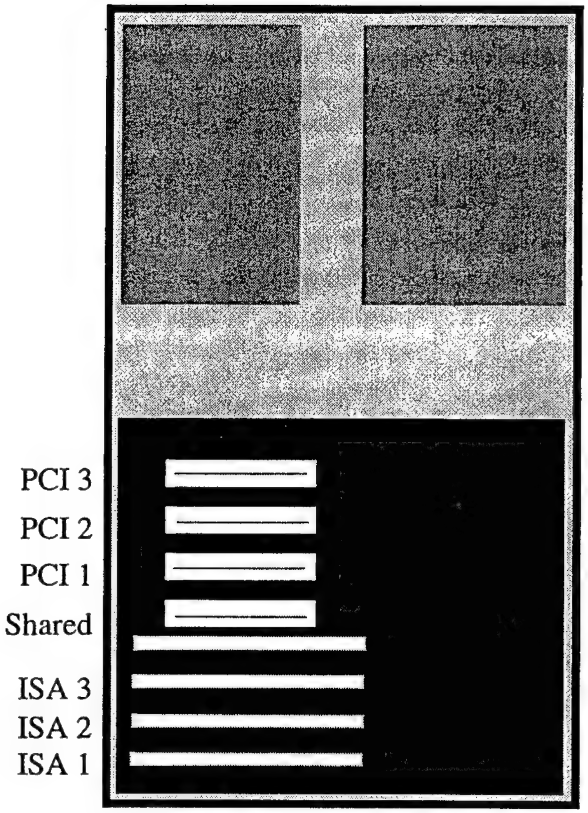
The Electronic House Call consists of two systems, Patient Monitoring Station (PMS) and Central Monitoring Station (CMS), connected over a cable network. The "heart" of each system is the computer and all associated components used in the EHC are connected through the computer. The following paragraphs will describe in detail the individual components comprising the CMS and PMS.

- Dell XPS-P120C - The Dell personal computer has a Pentium-based microprocessor with an internal speed of 120 Megahertz (MHz). It is configured with 32 Megabytes of Random Access Memory (RAM) and a 1.6 Gigabyte hard drive. There are four 32-bit PCI expansion-card slots and four 16-bit ISA expansion-card slots. The computer can accommodate up to seven cards (ISA and PCI) since one slot is a shared slot. It also has two serial ports and one directional parallel port. It has a standard 3.5" floppy drive and a 4X CD-ROM drive. It comes standard with a PS/2-style keyboard and PS/2-compatible mouse. It also comes standard with a pair of Altec Lansing speakers.

  The computer also comes equipped with SoundBlaster 16-bit audio board factory installed. It is capable of playing all prerecorded audio files used in the EHC software. The computer is subsequently configured with various boards that allow videoconferencing, ethernet, and expanded serial port capabilities. Figure 1 shows the internal configuration of the Dell XPS120C and indicates the location of all expansion cards.

- Matrox Video Board - The Matrox Millennium video board is a PCI-type board. It has the advantage of a 64-bit VGA-compatible graphics engine which provides fast graphics and video acceleration. It is a 2 MB VRAM board with a maximum display resolution of 1600X1200 pixels with 8 bits per pixel color resolution. In the EHC system, it is configured as 24 bits per pixel with a resolution of 800x600. This provides the highest color resolution possible with approximately 16 million colors and a relatively large display resolution. The maximum refresh rate is 72 Hertz for this configuration.

  A Diamond Viper Pro Video card was initially used in the EHC system on the recommendation of Intel; however, it was discovered that the system would frequently crash with this card installed. Many times this crash occurred over night when no one was working with the system. After many hours of tracking down the problem, it was discovered that the Diamond Viper Pro card is not compatible with Windows'95. Within a short time after that discovery, Diamond Multimedia released a statement to the effect that their Viper Pro card is not compatible with Windows'95. As a result, we switched to the Matrox Millennium card which performed well with Windows'95.



Internal View of the Dell XPS-P120C

PCI 3 - Empty
PCI 2 - Matrox video board
PCI 1 - 3-Com Etherlink III board
Shared - GTEK serial port board (PMS only)
ISA 3 - Sound Blaster 16-bit audio board
ISA 2 - Reserved
ISA 1 - ProShare Audio/Video board

Note: ISA 2 is reserved for the ProShare ISDN board if ISDN is the mode of communications employed

Figure 1. Dell XPS-P120C Internal Configuration

- 3Com Ethernet board - The 3Com EtherLink III BusMaster board provides the TCP/IP and UDP capability over a Ethernet LAN network. The board has a RJ-45 jack for a 10Base-T ethernet cable. It supports a maximum bandwidth of 10 Mbps. This card is used when the EHC system is operated in the LAN mode. If ISDN is chosen as the mode of communications, this board is not installed. A separate Intel ProShare ISDN board is installed in slot ISA 2 for ISDN communications.

- GTEK Serial board - The GTEK ISA serial port expansion board providing four additional communication serial ports to the existing two provided with the Dell XPS 120C. It has the capability of sending and receiving data at 460,800 bits per second per channel. The four port connectors accept an RJ-45 plug. The GTEK board also comes with the BBS Guardian Watchdog circuit which provides automatic reset of the computer in the event of a crash. The Watchdog basically performs a poling of the hard drive to determine if the system has crashed. The reset wire from the Dell computer is routed onto the GTEK board to enable it to reset the computer in the event of a crash.

  The GTEK board is only used on the patient computer (PMS) in the EHC. It provides a communication port for the Crikiton Dinamap Vital Signs Monitor and a means for recovering from a hardware failure. One limitation of the Watchdog is that it does not detect software failures. It has been our observation that in the vast majority of cases when the system fails, it is the software that has crashed and not the hardware.

- SoundBlaster Audio board - The SoundBlaster 16-bit audio card comes pre-installed in the Dell XPS120C computer. This card is used to play back prerecorded audio files in providing instructions to the patient as well as supporting the electronic stethoscope via its line-in port.

- Intel Proshare board - The Intel Proshare 150 Videoconferencing board is a full-length, single slot, 16-bit ISA board. It has four audio input/outputs and two separate video inputs. The four audio inputs are Line-In/Line-Out and Microphone/Headphone. The audio inputs are mutually exclusive, if Line-In is chosen Line-Out is chosen automatically. The two video inputs are a S-VHS Y/C input and a composite video input. Intel Proshare supports various network protocols including IPX and TCP/IP. It also supports numerous standards including the H.320 videoconferencing standard and T.120 data conferencing standard.

  The Intel videoconferencing system provides the capability to capture an image from the patient site video source and download it to the CMS. Compared with similar systems offered by other manufactures of videoconferencing equipment as well as stand alone video capture board the image quality was inferior; however, the clinical committee accepted the images as adequate for the EHC application. As clinicians use the system, the acceptability of this choice will be determined. Provisions have been made for the addition of video capture hardware should the clinicians require better image quality.

- ELO Monitor - The ELO monitor is a 17 inch, non-interlaced touchscreen monitor. The touchscreen provides an easy user interface for the EHC system. It has a fine dot pitch (0.27 mm) and a maximum resolution of 1280X1024. The monitor face has anti-glare and anti-static coatings to improve contrast and color performance in normal room lighting conditions. It automatic synchronizes to standard scan rates between 30 kHz and 65 kHz for the horizontal frequencies and between 50 Hz and 110 Hz for the vertical frequencies.

  In the Electronic House Call, the ELO Touchscreen monitor is configured for a display resolution of 800X600 and a scan rate of 60 Hz. The touchscreen is controlled through a serial communication port (COM 1) on the computer.

- Canon Camera - The Canon Communication Camera VCC1 provides panning, zooming and auto focus capability through a wireless infrared remote or through a computer. The camera outputs a NTSC video signal which is fed directly into the Proshare board as described above. The camera also has audio capability with a microphone and audio output which is not currently being utilized. The camera has both manual and automatic focusing capability. Automatic focusing is currently being used in the EHC system. The camera is controlled through a RS-232 port which is connected to the computer via serial communications port 2 (COM 2).

- Coherent Call Port - The Coherent Call Port is a desktop audioconferencing system. The Call Port is a full-duplex, directional microphone and speaker system with adaptive echo cancellation. It has a frequency response of 200 Hz to 3.4 kHz for transmit and receive. The microphone and speaker are contained within the same enclosure and connect to 1/8 inch microphone and headphone jacks on the Proshare board. The Call Port is also equipped with a Line-In/Line-Out harness that is not used. Two versions of the Call Port are installed because the manufacturing specifications changed before all of the units were

delivered. The newer versions have software that can be downloaded to obtain optimal performance for specific types of videoconferencing. The volume control function implemented with two buttons in the old design has been replaced with mute and echo cancellation buttons in the new design which can be confusing to the nurses. With the old version, a nurse could instruct the patient to decrease or increase the volume; pressing the same buttons on the new version will cause the sound to be muted or echo cancellation to be turned on or off. More than once this has resulted in a failed videoconferences due to unintended audio was muting.

In the Electronic House Call, the Call Port provides easy, hands-free operation of a full-duplex speaker/microphone system. The software configurable Call Ports have been optimized to work with the Intel Proshare Videoconferencing System. In practice, no difference in audio quality has been detected between the old and new versions.

- Zenith Cable Modem - The Zenith HomeWorks Universal Cable Modem provides a solution for connecting ethernet-based computers over a broadband cable medium. The modem has four connectors: one RS-232 for setup and diagnostic communication between modems, one ethernet 10Base-T, and two broadband "F" type, one for reverse channel (transmit) and the other for either forward channel alone (receive) or combined forward and reverse channels. A switch selects between the single (combined) cable and the two cable interface. The RF transmit and receive each occupy one TV channel bandwidth of 6 MHz within a forward channel tuning band of 50-550 MHz and a reverse channel tuning band of 10-30 MHz. The modem has LED indicators for RF activity and collisions, and ethernet transmit and receive data. Each modem and EHC system are assigned a unique IP address. The RF modem can be queried over the network to retrieve status information and to set parameters. The 3Com Ethernet board, installed in the computer, is connected to the cable modem by an RJ-45 (10Base-T) cable.

- Critikon Dinamap - One of the factors critical to the success of the EHC project was the ability to incorporate a vital signs monitor into the PMS in a manner transparent to the patient. It was decided that it would be confusing for the patient to be required to operate a piece of medical equipment as well as the touchscreen. The vital signs monitor needed to be embedded in the system, had to provide the results of measurements and allow the host computer to control certain aspects of the instrument's operation. The Dinamap Plus 8720 fulfilled these requirements through both its default operation as well as the its Host Communications protocol.

  The Crikiton Dinamap Plus 8720 provides many of the vital signs monitoring capabilities in the EHC system - pulse oximetry, temperature, ECG, and blood pressure. It can be controlled by a host computer via a RS-232 port. It has full-duplex, serial communications with a data rate of 9.6kBps. The Dinamap is equipped with audible alarms for out-of-range measurements.

  Two minor modifications had to be made to the Dinamap to facilitate seamless integration into the PMS. The EHC system was designed such that all the components' power switches would remain in the on position, and power to the entire system would be supplied through a single master switch. As initially configured, the Dinamap would not reactivate when line power was removed and reapplied to its power supply and so required the user to press the on button again. To circumvent this problem, the on switch was perma-

nently wired in the active state. This simulated a user pressing the on switch and achieved the desired effect. In addition, the internal speaker of the Dinamap was disconnected to prevent alarms from being heard since the alarms could not be deactivated through software commands.

Pulse Oximetry - The NellCore Pulse Oximeter is designed to monitor oxygen saturation and pulse rate noninvasively. The transducer can be switched from adult to infant size without re-configuring the Dinamap. Oxygen saturation is computed from the measured change in relative transmission of infrared and red light passing through the finger or toe.

Temperature - The Dinamap uses a YSI 400 temperature probe to measure and display body temperature in degrees Fahrenheit or Celsius. The measurement is designed for continuous operation so that approximately five probe time constants must elapse before the probe temperature reaches 99 percent of a step change in temperature. The probe is made of stainless steel for durability and is accurate to +/- 0.1 ^{o}C. The probe may be sterilized in cold liquid disinfectant.

ECG - The Dinamap has a three-wire electrocardiograph built-in and is capable of displaying a Lead I waveform. It detects a "Lead Off" condition and can communicate that condition to the EHC computer. The lead wires are color-coded for correct placement. The ECG waveform data is communicated in a continuous stream through the data port of the Dinamap to the PMS. The reconstructed waveform can be displayed at one of three sweep speeds (12.5 mm, 25 mm, or 50 mm per second). The ECG waveform can also be used to calculate heart rate.

From the EHC perspective, there are both similarities and significant differences in the ECG measurement as compared with the other parameters. The Dinamap begins recording an ECG waveform once all three lead wires have been attached. ECG data, unlike the other measurements, is reported in binary format. The host directs the Dinamap to send a continuous stream of binary coded data blocks and then unpacks the blocks and reconstructs the ECG waveform data as specified in the Dinamap Plus Host Communications Reference manual. Under this arrangement, the Dinamap continues sending binary data until instructed by the host to stop.

Blood Pressure - The Dinamap uses the oscillometric technique to measure blood pressure noninvasively and to display systolic, diastolic, and mean arterial pressures and pulse rate. It is also capable of sensing cuff size and switches automatically between adult and neonatal sizes. It also has automatic and manual operating modes.

Blood pressure measurements are started and canceled under control of the host. The Dinamap Host communications protocol includes ASCII commands for starting and canceling a measurement. The Dinamap interprets the commands, initiates a measurement cycle, and updates an internal status register which tells if the measurement cycle was successfully completed. To obtain a blood pressure reading, a non-invasive blood pressure status command is issued to the Dinamap. The response gives status information which tells if there has been an error or if the measurement is still proceeding. If the measurement completed successfully, the systolic pressure, diastolic pressure, and mean arterial pressure are contained in the response string.

- MTI Stethoscope Send Unit - The MTI stethoscope send unit is compressed of an electronic stethoscope, amplifier, headphones, and power supply. The amplifier boosts the signal from the stethoscope microphone and outputs a audio signal at line level (6 dBm). This

output is connected to the Line-In jack on the Proshare board. The amplifier also has a high level low impedance headphone output which connects to a pair of headphones to allow the patient to monitor the stethoscope sounds. The amplifier was adjusted for a gain of 75 V/V to match the stethoscope signal level to the range of the audio line input on the Proshare board.

- MTI Stethoscope Receive Unit - The MTI receive unit is equipped with an equalizer that takes a line level input and outputs at a level and impedance suitable for headphones. The Line-Out of the Proshare board on the CMS is routed to the equalizer and then to an Andries Tek stethophone for the best possible low frequency response. After clinician feedback that heart and lung sounds were too weak, the receive unit was removed from the system and the Andries Tek stethophone was connected directly to the Line-Out jack of the Proshare board.

- Bush Cart - The Bush Computer cart holds all the components of the Electronic House Call. A cart was needed that could be functional, transportable and easily usable. The Bush 4209A computer cart comes unassembled although assembly is easy. There are two slide out trays provided with the cart. The top-most, long tray was used to hold the diagnostic devices for the PMS and the keyboard, mouse, and Andries Tek for the CMS. The middle tray was removed in tower-style computer systems to give more space. Desktop-style computer systems utilized the middle tray to hold the Critikon Dinamap and the stethoscope send unit. The middle tray was not used on the CMS. A black plexiglass door was added on both systems to conceal the interior parts of the Electronic House Call.

Clinicians emphasized the importance of lighting from the beginning and this has been a difficult problem to address. The objective has been to achieve lighting similar to that used by a professional photographer without blinding the patient. A number of solutions have been sought with little success. The final system configuration uses a soft-white fluorescent light mounted on top of the monitor. The success or inadequacies of this solution will be determined as clinicians use the system to monitor patients in which lighting plays an important role in an accurate assessment. Phase II efforts should address lighting concerns raised by the clinicians as well as procedures for obtaining accurate color representations.

The hardware configuration for the prototype EHC telemedicine system has been finalized. A detailed procedure has been established for configuring the hardware for both the PMS and the CMS. This written procedure may be found on pages D-45 through D51.

Much work remains in reducing the cost and size of the system and it is hoped that these concerns can be addressed during Phase II of the project. The vision of the technical research team is to develop a television set-top box which will provide the functionality identified above using the patient's television as a display monitor and a remote control to interact with the system.

Software

Software developers from the Interactive Multimedia Technology Center (IMTC) were contracted to provide a patient and care provider interface for the EHC telemedicine system. The IMTC staff worked closely with BITC researchers and clinicians at MCG to define the software requirements for the system. As the software was used by clinicians and patients, many bugs were discovered and subsequently addressed. Researchers within BITC modified the software in

response to problems reported by users and several updates were released throughout the project. A major software update was performed during the first week of August which represented the final version under Phase I. This version of the software provided a much more stable platform and addressed many of the problems encountered by clinicians and patients. Although the software is generally stable, there are still requests, primarily from clinicians, for updates in the code. Occasionally, the software experiences a failure due to errors encountered in the database functions. Software efforts under Phase II will address these problems and will investigate the possibility of porting the code to a more robust language such as C.

The current software design balances the need to control many functions with the need to keep the user interface simple enough for a non-technical patient to use unassisted in the home. The entire focus is on bringing medical care into the patient's home without sending a care provider. Thus, the patient will be running the system, and the first and foremost goal is to make it easy to use.

The Electronic House Call software is written in 16-bit Visual Basic 4.0 running on the Windows 95 operating system with the hardware specifications previously listed. There is a seamless integration of four major functions: communications (audio/video/data), data acquisition, database management, and camera control. These functions are implemented within a single software application. Several Programmer Developers Kits (PDK's) provide a means to customize the user interface functions which comprise the EHC custom software application. The communication aspect is provided by Proshare PDK 2.0 and provides live two-way video, full-duplex audio, data channels, and file channels. The data acquisition is provided by the Johnson & Johnson Dinamap PDK. A serial communication port on the computer allows for two-way communication between the application program and the Dinamap for control of and data collection from the pulse oximeter, electrocardiograph, blood pressure recorder, and thermometer. The data are transmitted through the network to the CMS. The database is constructed in Jet Database Engine 2.5. It provides data management, storage and retrieval. The camera control is provided by Canon VCC1 PDK. This provides control of the camera's power/pan/zoom features.

Software for the Patient Monitoring Station (PMS)

The software design for the patient monitoring station is centered on a home screen from which the user initiates actions, and to which the user will always return after completing a task. The patient quickly becomes familiar with this home screen and is able to return to this screen from most program levels at any time. The home screen, shown in Figure 2, consists of only four icons and selections are made by touching the icon on the screen. The four picture icons, represent the functions that the patient can select: 1) a phone icon initiates a video conference with the nurse at the central monitoring station, 2) a stethoscope and chart icon initiates vital signs measurements, 3) a stack of books icon initiates a medical information search, and 4) a question mark icon initiates on-line help.

- Video Conference Call To The Central Monitoring Station - The phone icon on the home screen initiates a videoconferencing link to the hospital. A window pops up with a list of patients registered with the CMS for this particular PMS unit, including the name "Not a Patient." This controls how off-line measurements are saved (or not) in the CMS database. The patient then touches his/her name and a connection request is sent to the CMS. The nurse at the CMS must be present to accept the call. Videoconferencing is supported through software calls to the Intel ProShare videoconferencing software PDK as described

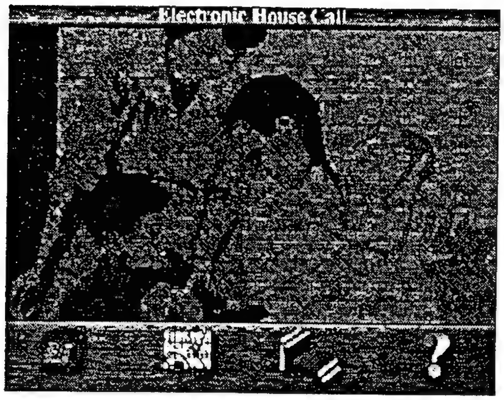


Figure 2. Patient Monitoring Station Home Screen

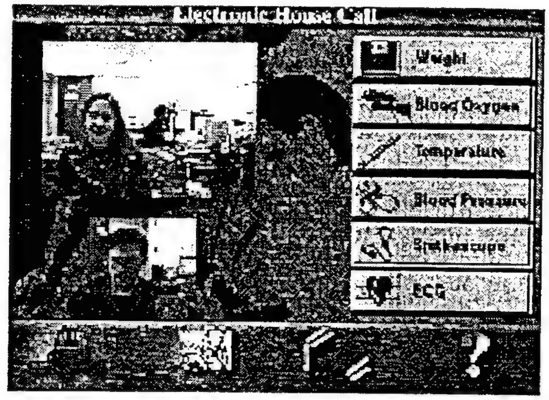


Figure 3. EHC Videoconferencing Screen

above. Once the call is accepted at the receiving end, the video, audio, and data channels are opened to provide live two-way communications. Two video windows are displayed one top of each other. The top window is larger in size and contains the video from the CMS. The bottom window contains the local video so that the patient can view the image that is being sent to the CMS. The videoconference screen is shown in Figure 3. If the central monitoring station is busy, the patient will not be able to connect. The consortium agreed that for the Phase I pilot study, patients would be instructed to use conventional emergency procedures (911) to obtain care under emergency situations. Phase II enhancements will notify the CMS that a new call is coming in and allow the CMS to handle multiple calls.

- Vital Signs Measurement - If the patient selects the vital signs icon, a menu of options is displayed on the right side of the screen as shown in Figure 4. The patient touches the icon to select the desired measurement. Except for the case of "Not a Patient," each vital sign measurement is automatically transmitted to the CMS. After a measurement is selected, a new window displays written step-by-step instructions, an illustration showing how the device should be used, and a recorded voice paraphrases the written instructions. The initial screen presented to the patient for the blood oxygen measurement is shown in Figure 5. In addition, the patient can select help by touching the "Tell Me More" button. This feature plays back an audio/video clip showing the measurement steps and demonstrates the procedure necessary to take a measurement. All audio/video clips are stored as (.mov) files and are played using Apple's QuickTime Player software. The medical devices currently supported include:
  1. Stethoscope for heart and lung sounds - transmitted via the Proshare audio system
  2. ECG - transmitted via data channel in Proshare
  3. Pulse Oximetry - transmitted via data channel in Proshare
  4. Weight - transmitted via data channel in Proshare
  5. Temperature - transmitted via data channel in Proshare
  6. Blood Pressure - transmitted via data channel in Proshare

Measurements can be taking during a live video conference or taken off-line, when there is no video conference. In either case, the measurement values are stored in a local

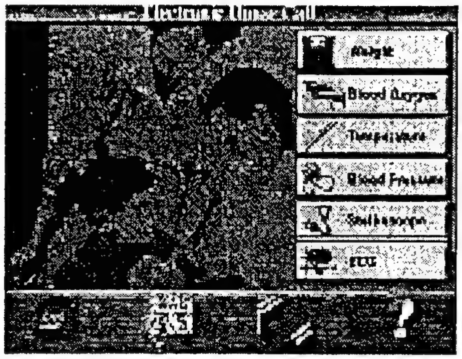


Figure 4. Main Vital Signs Menu

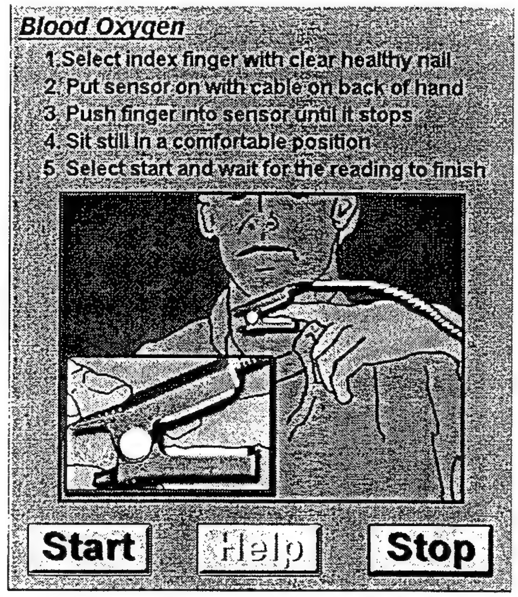


Figure 5. Initial Screen For One Vital Sign Measurement

database, and automatically transferred to the central monitoring station. In the event of an error during the reading of a measurement, audio/video clips describing the problem and all the possible causes of that problem are shown.

- Medical Information Resources - The stack of books icon initiates a medical information application as shown in Figure 6. Currently this is an AMA program on CD-ROM which provides general medical information in an encyclopedic format. Phase II development will expand this function to provide Internet access to selected medical information sources and patient support groups.

- Main Help - On-line help is available by selecting the question mark icon. A simple overview of the EHC project and basic instructions are currently displayed as text, but the software is designed to include still images, audio, and video clips in future development. This type of multimedia help is already provided for the vital signs measurement functions.

Software for the Central Monitoring Station (CMS)

The Central Monitoring Station for the Electronic House Call provides the care provider with videoconferencing and data display tools in a Windows 95 environment. The EHC program starts by double clicking the EHC icon on the Windows desktop. A control window opens with a menu bar of commands. Figure 7 illustrates the CMS screen with several windows presenting an audio/video conference, a patient list, local and remote camera control, and patient statistics. The menu bar can be used to invoke many of the CMS functions as well as to perform standard Windows operations such as Exit, Open a File, and Save.

- Patient List - Upon starting, the EHC application first displays a patient list as shown in Figure 7. The list contains all the patients registered with the CMS. Once a patient is selected from the list, there are six functions which may be invoked - information about a

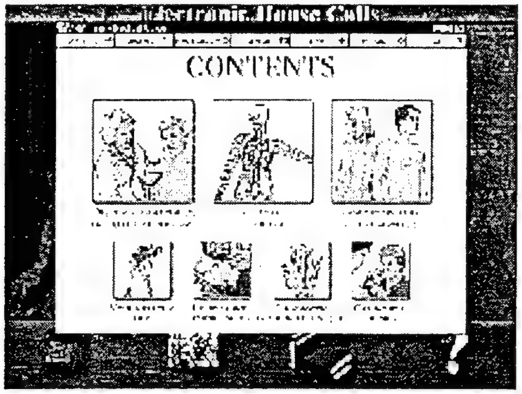


Figure 6. Medical Information (AMA Family Medical Guide) Screen.

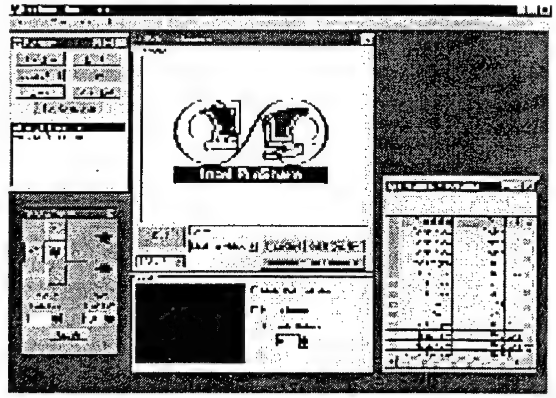


Figure 7. CMS Main Screen: Video Window Patient List, Camera Control and Statistics.

patient, patient statistics, place a call to the patient, test the patient's connection, add a new patient, and delete an existing patient. All operations on the patient list are controlled through the Jet database.

Information on a patient include address, phone number, system number, IP address, ISDN address and relevant doctor information. Patients can have similar system numbers, IP addresses and ISDN numbers since multiple patients can be accommodated at a PMS.

Once changes are made to the patient list, they are transferred to the PMS via the data channel.

- Making A Video Call - A video calls to a patient is placed by clicking on the "Video Call" button. A call is routed to the appropriate system by the IP address that is associated with each system number and the system number that is associated with each patient. Once the call is accepted at the receiving end, Proshare plays live video and audio. The data and file channels are also opened for transferring measurement data and control messages.

- Controlling The Remote Camera - The CMS software has controls for panning and zooming its own camera as well as the PMS camera. This allows the nurse to see a particular region of interest within a wide field of view i.e. to determine if the patient has correctly placed a diagnostic monitoring device. The zoom capability allows the nurse to magnify skin lesions, bruises, etc. The rate of camera movement can be adjusted for fine control at high magnification or for coarse control at a wide angle field of view. The camera output is fed into the Proshare card, described in the hardware section. The camera is placed in a low power standby state after each call lengthen the life of the camera.

- Initiating Remote Measurements - The six diagnostic measurements previously described can be controlled by the CMS. The CMS can initiate and cancel any measurement at any time. These commands are sent through the Proshare data channel to the PMS. The PMS interprets the command and starts the correct measurement. Only one measurements can run at a time, and a command to start another measurement cancels the previous measurement as the new measurement begins.

- Taking Video Snapshots - The CMS can take a snapshot of the remote video and saved it

in the patient's database for future viewing.

- Reviewing Data In Database - The patient measurements and images are stored in the patient's "Stats". A patient's statistics includes the time/day stamp, type of measurement, data taken, and any comments about the measurement. All videoconferences, images, and off-line measurements are also recorded in the "Stats". All off-line measurements are tagged as off-line measurements in the comments box. Any measurement can be deleted from the Stats.

Other Software Needed To Run Electronic House Call

The Electronic House Call package uses a Quicktime Movie Player to display the help videos on the PMS. The AMA CD-ROM application runs a medical information database resource. Intel's ProShare video conferencing hardware and software is incorporated into the Electronic House Call system to support the videoconferencing and data transfer options. The ProShare Developers Kit was used to create a customized user interface to the ProShare videoconferencing tools.

Electronic House Call Video/Audio Help Scripts

Help scripts are provided the to guide patient through the diagnostic monitoring procedures. When the patient initiates a measurement, the associated help screen appears with written and voice instructions for proper application of the diagnostic sensor. If the patient is still unsure, pressing the "HELP" button will invoke further instructions via voice and video clips demonstrating the procedure. The following paragraphs document the instructions and scripts used in the help system.

- Blood pressure: - Instructions:
  1. Secure cuff on arm just above elbow.
  2. Position arrow at inside elbow pointing toward hand.
  3. Sit still in comfortable position with arm on rest.
  4. Select start and wait for measurement to complete.

Illustration:

arrow on cuff in position on arm.

Video Voice Script:

You are about to begin your Blood Pressure measurement. This is like the blood pressure measurement in your doctor's office. If your clothing is covering your upper arm, you will need to remove it in order to get an accurate reading. Next, slide the blood pressure cuff around your upper arm just above your elbow. Position the cuff so the arrow on the cuff is on the inside of your arm, opposite to your elbow. The arrow should be pointing down your inner arm toward your hand. The cuff is secured by Velcro and will expand during the measurement. Sit in a comfortable position with your arm resting on a support at about heart level. The arm on your chair or sofa would provide good support, or you can use a pillow or cushion to achieve the same result. During the measurement, the cuff will expand and become tight for about thirty seconds. This may be uncomfortable, but the tightness will release very soon after the measurement is completed. If at any time it becomes unbearable, you can select stop to quit the measurement and loosen the cuff.

When you are ready to begin the measurement, sit in a comfortable position and select Start. Please remain still during the measurement. You will be alerted when the measurement is complete. If you want more instructions, select “Tell Me More”.

Tell Me More Script:

The blood pressure cuff should be ready to slide onto your arm at the beginning of the measurement. If you have problems with the cuff, you may need to adjust the Velcro position. To do this, pull apart the Velcro and wrap the cuff around your arm so that it fits somewhere between loose and snug. It should not be tight, but it should not be so loose that it falls easily off of your arm.

Error Script:

An error has occurred during the blood pressure measurement. Please make sure that the cuff is positioned and secured correctly. Remember to remove any clothing covering your arm. Also avoid restricting the blood flow by rolling up a sleeve. During the measurement, you must remain quiet and still. Noise or movements can disrupt the signal. After checking to make sure that everything is set up correctly, try starting the measurement again. If a second unexplained error occurs, stop the measurement and report the problem to the monitoring station.

- Pulse Oximeter - Instructions:
  1. Select index finger with clear healthy nail.
  2. Clip sensor on finger with cable along back of hand.
  3. Push finger into sensor until it stops
  4. Sit still in comfortable position.
  5. Select start and wait for measurement to complete.

Illustration:

Hand with oximeter in position on index finger with cord out over top of hand and pads in full contact. Finger tip against stop.

Video Voice Script:

You are about to measure your blood oxygen level with a pulse oximeter. This is done with a small sensor that interprets a light shining through your finger nail. The sensor clips comfortably on your finger and you will not feel any pressure or heat from the light. Before you start, make sure that your hands are clean and dry. Normally you will place the clip on your index finger, but you should choose another finger if the index finger is injured or has a discolored nail. The finger you choose must not have any bandages or artificial nails. If you have on nail polish, you will need to remove it before continuing. Place the sensor clip on your finger with the finger tip against the stop. If you have long finger nails, they should extend over the stop. Make sure the sensor is positioned so that even force is applied over the length of the pads. The cable of the sensor should run along the top of your hand. Sit in a comfortable position and begin the measurement by selecting Start. The measurement takes between fifteen and thirty seconds to stabilize. Please remain still during the measurement, and you will be alerted when the measurement is complete. If you want more instructions, select “Tell Me More”.

Tell Me More Script:

Pulse oximetry can have problems when a finger or nail is damaged, discolored, or suffering from poor circulation. In these cases another finger should be chosen. Most finger nails can fit inside the sensor if they are positioned correctly over the top of the finger

stop, however, extremely long nails may need to be clipped before the sensor can be used.

Error Script:

An error has occurred during the pulse oximetry measurement. Please make sure that the sensor is positioned correctly. However, if the sensor is too tight, this could also cause erroneous values. Remember that the finger must be clean and dry, and there should be no nail polish or any other covering on the finger. The finger should be healthy with a clear nail. Avoid fingers with poor circulation, and avoid fingers that are bruised under the nail. During the measurement, you should remain quiet and still. You should not have anything on that would restrict the blood flow to your finger (no blood pressure cuff and no rolled up sleeves). It is possible that bright light can interfere with the measurement, and if you're not sure you can cover the sensor with a towel. After checking to make sure that everything is set up correctly, try starting the measurement again. If a second unexplained error occurs, stop the measurement and report the problem to the monitoring station.

- Temperature - Instructions:
  1. Do not eat or drink for twenty minutes.
  2. Place sterile sleeve over temperature probe.
  3. Position temperature probe under tongue.
  4. Keep probe under tongue during measurement.
  5. Select start and wait for measurement to complete.

Illustration:

Probe under tongue in cutaway of mouth.

Video Script:

You are about to take your Body Temperature. Have you had anything to eat or drink in the last 20 minutes? If so, your temperature measurement may not be accurate. To determine your body temperature, find the temperature probe provided. Put a clean plastic sleeve over the end of the temperature probe. Position the probe under your tongue and as far back as you can without discomfort. When you are ready to begin the measurement, sit in a comfortable position and select Start. Remember to keep the probe in place until the measurement is finished. You will be alerted when the measurement is complete. If you want more instructions, select "Tell Me More".

Tell Me More Script:

Some temperature probes may look different from the one shown in the first video illustration, but they will function in the same way.

Error Script:

An error has occurred during the temperature measurement. Please make sure that the temperature probe is positioned correctly under your tongue. During the measurement, you must keep the probe under your tongue. After checking to make sure that everything is set up correctly, try starting the measurement again. If a second unexplained error occurs, stop the measurement and report the problem to the monitoring station.

- Stethoscope - Instructions:
  1. Place flat white side of stethoscope directly on skin.
  2. Hold stethoscope in position as directed.
  3. Sit still and remain quiet during measurement.
  4. Be sure not to move fingers holding stethoscope.

5. Select start and wait for measurement to complete.

Illustrations:

Positions on chest for heart sounds
Positions for lung sounds on chest
Positions for lung sounds on back
Close-up picture of switching stethoscope to “flat white side”
Close-up picture of stethoscope's “flat white side” (membrane)

Video Voice Script:

You are about to record your heart and lung sounds using a stethoscope in much the same way as your doctor would. The electronic Stethoscope provided with your system records heart and lung sounds and transfers them to the monitoring station. The measurement is made by placing the flat white side on the stethoscope directly on your skin. You can hold the stethoscope inside a loose gown or cover-up, but you need to remove any under garments so that the stethoscope contacts the skin. You will normally be guided by someone at the monitoring station while you position the stethoscope, but these diagrams show some of the standard positions for the listening to the heart and lungs. Before starting, make sure the stethoscope is switched to the white measurement side. Relax in a comfortable position. It is important that you remain still during the measurement and that you do not move your fingers holding the stethoscope. The monitoring station will initiate the measurement if they are guiding you, or you can initiate the measurement by selecting Start. The measurement will last for ten to twenty seconds, and you will alerted when it is complete. If you want more instructions, select “Tell Me More”.

Tell Me More Script:

The electronic stethoscope on your system should always be switched to the flat white side. If it is not in this position, the heart and lung sounds cannot be measured correctly. You can verify that the stethoscope is set correctly by looking closely at the small hole in the center of the “bell” on the opposite side from the white surface. While holding the bell in one hand, grasp the short shaft leading to the wire in your other hand. As you roll shaft between your thumb and index finger, it clicks into two distinct positions. Now observe the hole in the center of the bell as you roll the shaft. In one position, the hole is shallow, and in the other position, the hole is deeper. To use the white surface for measurements, the stethoscope should always be in the shallow position. You might also notice that the shaft is angled toward the bell side, and away from the white surface when it is in the correct position.

Error Script:

An error has occurred during the stethoscope measurement. Please make sure that the stethoscope is switched to the correct position for measurements through the flat white surface. It is also important to make sure the stethoscope is in direct contact with the skin and that you remain quiet and still throughout the measurement. After checking to make sure that everything is set up correctly, try starting the measurement again. If a second unexplained error occurs, stop the measurement and report the problem to the monitoring station.

- ECG - Instructions:
  1. Prepare skin surface as instructed in Help video.
  2. Place adhesive patches as directed.

3. Snap wires onto patches: black to upper left, red to upper right, white to lower left.
4. Sit still and remain quiet during measurement.
5. Select start and wait for measurement to complete.

Illustration:

electrode sites diagram w/ - red, white, and black - onto snaps on adhesive patches

Video Voice Script:

You are about to make an ElectroCardiogram, or ECG, measurement. The ECG records heart signals through three wires that are attached to adhesive patches on your skin. You will feel no heat or current during this measurement, and the most irritating part is in removing the adhesive patches at the end. You will normally be guided by someone at the monitoring station while you position the patches, but these diagrams show some of the standard positions. The best measurements are made when the patches are in an area that is free of hair, and you may be asked to shave a small area where a patch will be placed. Clean the area with alcohol and make sure the skin is completely dry. Then, peel off the back of the adhesive patch and stick the patch onto your skin. There are colored snaps on the end of the ECG wires that will connect the wires to the metal button in the center of each patch. Snap the black connector to the patch near your upper left shoulder, the white connector to the patch on your upper right shoulder, and the red connector to the patch on your lower left side (just above your waist). You are now ready to begin your ECG measurement. The monitoring station will initiate the measurement if they are guiding you, or you can initiate the measurement by selecting Start. The measurement will last for ten to twenty seconds, and you will alerted when it is complete. If you want more instructions, select "Tell Me More".

Tell Me More Script:

ECG measure electrical activity in the heart. The adhesive patches that are placed on the skin form an electrical contact with the body, and that is why it is important for the skin to be clean and free from hair at the locations where the patches are attached. There are different types of ECG measurements that can be made. For this system, the standard measurement will be made while you are in a sitting position, and the patches are placed near your shoulders and on your side. Other types of measurements may be requested by the monitoring station, and they can guide you during a video conference for those measurements.

Error Script:

An error has occurred during the ECG measurement. ECG can be negatively affected by incorrect position of the patches, improper preparation of the skin, or movement during the measurements. Please make sure that the patches and the electrodes are properly attached. During the measurement, you must remain quiet and still. Noise or movements can disrupt the signal. After checking to make sure that everything is set up correctly, try starting the measurement again. If a second unexplained error occurs, stop the measurement and report the problem to the monitoring station.

- Weight: - Instructions:
  1. Place scale on hard flat floor surface.
  2. Stand on scale dividing weight evenly on both feet.
  3. Report weight measurement as directed

Illustration:

Scale with feet in position to step on scale

Video Voice Script:

You are about to make a weight measurement. Weight changes can provide important information about your health status, and you may be asked to make regular measurements on your own or to make a measurement during a conference with the monitoring station. Use the scale provided with your system to measure your weight. Be sure the scale is on a hard flat surface before weighing. Select start to record the results.

Tell Me More Script:

Error Script:

An error has occurred during the weight measurement. Please make that the scale is placed on a hard flat surface. After checking to make sure that everything is set up correctly, try starting the measurement again. If a second unexplained error occurs, stop the measurement and report the problem to the monitoring station.

Electronic House Call Database

An rudimentary patient database is provided to catalogue patient information and vital signs. Information regarding vital signs is entered into this database each time the patient takes a measurement irrespective of whether they are currently in a videoconference. The care provider can access this information in graphical or text format. Graphical representations are very useful for establishing a trend in the data. Textual comments as well as video images can also be stored.

There are two parts to the database. The "master" database is stored on the CMS and contains past measurements, patient information, doctor information, and PMS phone numbers and addresses. A "slave" database resides at the PMS to store patient information as well as to hold off-line measurements until the PMS establishes communication with its CMS and the data can be transferred to the master CMS database (a description of the synchronization process is given below). With the exception of measurements, all other EHC information is entered into the master database at the CMS.

There are four types of information stored in the EHC database:

- Information about the CMS
- Information about the PMS
- Doctors' information
- Patients' information
- Synchronization queue.

Off-line transactions are defined as transactions with the database that occur while a videoconference is not in progress. On the CMS, off-line transactions include:

- Adding/Deleting patients and/or doctors

- Adding/Deleting PMS units and/or their addresses/phone numbers

- Viewing/Deleting past measurements from a PMS.

On the PMS, off-line transactions are:

- Taking measurements - When off-line transactions take place, the local database is changed and a record of that change is stored in a "queue" (an ordered table containing the change), along with an address for which PMS/CMS site the change should be sent to. Every so often (the interval can be set by the user) during "idle" time (i.e., not videoconferencing), the EHC program on the CMS/PMS checks to see if there are any records in the queue. If there are, the EHC software initiates a connection with the first PMS/CMS unit in the queue and proceeds to send the changes to be made to that unit. As each change is received and performed, the receiving unit responds with a handshaking signal to indicate that the change was made successfully. When a confirmation from the other computer is received, that record is deleted from the queue. If the confirmation is not received, the record is skipped and is saved for a future attempt. This approach ensures that no data is lost due to garbled communications, software crash, etc.

On-line transactions are defined as transactions with the database that occur while a videoconference is in progress. On the CMS, on-line transactions include:

- Viewing/Deleting past measurements from a PMS.

On the PMS, on-line transactions are:

- Taking measurements

All on-line database transactions occur on the CMS database. When a measurement is taken, the PMS transmits the data to the CMS immediately for storage in the CMS database. The CMS operator is then able to view/delete the measurements while on-line.

System Installation

The first two EHC Patient Monitoring Stations were installed in patient homes on February 26-27, 1996. One patient was an EAMC patient and the other an MCG patient. Each systems was tested at installation by linking with the CMS to which it was registered. The connection between the MCG patient and CMS appeared to work well; however, the EAMC CMS showed a frozen video image of its patient most of the time and the audio was broken. Jones Intercable was notified of the problem and began to investigate the cause of the poor connection. After two weeks of working on the problem, Jones Intercable could find no problems in the CATV system which would cause a poor connection with the EAMC patient. The technical committee eventually identify software, hardware, and network issues that could contribute to the problem.

Georgia Tech researchers began to address problems with the software as they arose and focused efforts on a major software revision that would result in a more stable platform. This software revision solved many of the database problems and added the capability of transferring off-line measurements to the CMS. The prior software release allowed patients to perform off-line

measurements; however, the results were not transmitted to the CMS. In addition, the prior release did not accommodate multiple patients to be associated with a single PMS, and did not allow for multiple CMSs to serve one PMS as required by the nursing home site.

Researchers at Georgia Tech, MCG, and the Center For Total Access (CTA) addressed network problems and ran a series of tests on the Ascend inverse multiplexors. Technical support from Ascend recommended changing several parameters which solved the problem of not being able to initiate a call from the MCG side of the network to EAMC. However, the quality of the audio and video remained poor. It was unclear whether the poor audio and video were a result of the multiplexors, the CATV system, the ISDN lines, or a combination of factors.

The technical committee decided to study the CATV network signal levels and noise. Researchers at MCG devised a method to measure bursty noise on the return channel which was empirically related to the success or failure of a videoconference. MCG recorded the noise activity continuously for several days and then during office hours for several more days (see pages D-52 through D-83) to look for trends in when the noise occurred. This would allow Jones Intercable to track down the source of the ingress noise and eliminate it. Unfortunately, the noise occurred at random times, and no trends could be established. This information, however, was used to determine if a videoconference would be successful so that the nurses could avoid connecting with patients during times of high ingress noise. In addition, the information could be used to explain a poor connection after the fact.

It was also discovered that if the return channel signal level were low from a particular patient site, then the videoconferencing quality would be poor. This was the case for the first EAMC patient installed in which the video and audio were unacceptable. Subsequent tests with different signal levels indicated that if the signal level fell below 0.8V peak-to-peak, then the videoconferecing quality would be unacceptable. It was agreed that MCG would monitor the signal levels to all patient homes four times daily (see pages D-84 through D-98). When the signal level to any home fell below 0.8V, Jones Intercable personnel were notified and addressed the problem immediately.

CTA personnel concentrated on solving problems with the ISDN connection between EAMC and MCG. A testbed system was established between the hospital at EAMC and a laboratory site at CTA. Tests were conducted in which Intel Proshare alone was run and compared with the quality of the EHC system which has Intel Proshare imbedded in it. There appeared to be no difference in the quality; however, it was discovered that the audio and video quality were better when operating in "smoother" mode. Intel Proshare has two modes in which one can operate. "Sharper" mode utilizes 400Kbps of bandwidth and the video resolution is set to FCIF (352X288). When operating in "Smoother" mode the video resolution is set to QCIF (176X144) and utilizes 200Kbps of bandwidth. The "Smoother" mode sacrifices video resolution to gain better video motion (i.e. a higher frame rate). Feedback from the nurses indicated that a higher frame rate was more desirable than higher resolution; therefore, the decision was make to operate the EHC system in "Smoother" mode. This resulted in substantial improvements in the audio and video transmitted over the MCG/EAMC ISDN link. As a result, the EAMC nurse was able to visit with patients more reliably from EAMC.

Installations of Patient systems from March through July included six EAMC patients, two MCG patients, and the nursing home. All CMS systems serving civilian, military, and nursing home patients had been installed by the end of May. The patient installation schedule was reduced significantly from the original plan due to problems encountered with the software and difficulties in maintaining a stable network. It was determined that further installations should be halted until

a stable network and reliable software performance could be achieved.

A major software revision was completed during the last week of July and was scheduled for installation during the week of August 5. Although the elimination of ingress noise had not been achieved, a means for managing it as well as coordinating the debug activities of Jones Intercable around patient visits had been achieved. The reverse channel signal levels were being managed using the established procedure of monitoring them four times daily and reporting any problems to Jones Intercable. The technical committee met on August 5 and decided that the installations should continue with the new software version and approved the methodology for managing the network. It was agreed at that meeting that all EHC systems would use the lower resolution video to achieve a greater frame rate allowing military patients to be visited from EAMC. In addition, Georgia Tech agreed to have someone available "on-call" in the Augusta area Monday through Friday of each week to address technical problems.

The installation of patient systems proceeded at a rapid pace following the software update and concluded on September 30, 1996 with 16 patient systems serving 24 civilian and military patients, and one nursing home. One military patient system was removed; however, this was deemed an installation since data was obtained regarding that patient. A single installation occurred on October 7, 1996 as well as the removal of a system from a civilian patient's home, which maintained the same number of systems and patients. All CMS units have been installed and are currently operational.

TECHNICAL REVIEW OF HOME HEALTH CARE TELEMEDICINE SYSTEMS

GEORGIA INSTITUTE OF TECHNOLOGY
BIOENGINEERING CENTER

Background

Technical experts from the Bioengineering Center, Eisenhower Army Medical Center, and the Medical College of Georgia, have jointly evaluated three home health care telemedicine systems that appear promising for use in the Army funded Electronic House Call program. The systems were selected from an extensive search involving advertisements on the world wide web, postings to relevant internet news groups, and telephone conversations. The three systems evaluated were:

- Health Tech Services, Corp. - HANC
- H.E.L.P. Innovations, LC - Resource Link
- American Telecare, Inc. - PTS100S

Various other teleconferencing/telemedicine systems were investigated and deemed not appropriate for our application. These systems included

- VTEL, Inc. - DeskMax
- Data Point, Inc. - MINX 2000
- AT&T - Picasso
- MD/TV
- British Telecom - VC7000 and VC8000

The following discussion will center on the three systems which appeared to be most relevant to our project and were evaluated extensively via demonstrations (Health Tech and American Telecare) and presentations (H.E.L.P. Innovations) at Ft. Gordon. A brief description of each demonstration and/or presentation is given followed by a discussion of the advantages and disadvantages of each system as it relates to the objectives defined early by the consortium. Finally, the three systems are compared with each other to determine the most appropriate direction for the consortium. A concluding recommendation based on our best understanding of the state-of-the-art suggests a strategy to deploy home-based systems rapidly.

Health Tech Services, Corp. - HANC

The meeting opened with a brief discussion of the consortium's purpose and goals. This was followed by a discussion by Health Tech representatives concerning their business structure and market strategies. From a business standpoint, Health Tech seemed to be well positioned to carry forward the deployment and support the future development of HANC. A prototype HANC system was brought to Ft. Gordon for demonstration to the consortium. It appeared that HANC is currently in a prototype stage and that production units have not been made. Representatives from Health Tech indicated that it would take approximately six months to manufacture units for delivery. It was our understanding that Health Tech has capital available to make possible the manufacture of HANC units. If this is not the case, it could seriously limit the time required to obtain units and tremendously impact the cost of each unit.

HANC is a PC-based system which provides communication between the home and a central station via standard telephone lines. Currently HANC is capable of monitoring blood pressure, temperature, EKG, and heart and lung sounds of home-bound patients. HANC's software has been developed primarily from the standpoint of medication reminding and guiding the patient through a diagnostic procedure. Issues regarding HANC that are relevant to our project are listed below.

1) *Two-Way Audio/Video* - HANC does currently support this; however, it is over a standard phone line and is therefore very "jerky" (3-5 frames/minute). Mention was made with respect to implementing ISDN, Switched-56, etc. for better video and the comment was made that "it does not matter which medium you use, HANC could work over it." While this may be true in the long term, it is not as simple as it was made to sound. The software necessary to compress/decompress audio and video under the current standards must be developed and integrated into HANC. Should ethernet over cable be the preferred means of transport, the packet drivers to support ethernet must also be developed and integrated into the HANC software.

2) *Architecture* - Currently HANC is an open architecture system supporting JPEG compression of video images. Some talk was made regarding fractal compression to increase the frame rate over the telephone line. This is possible; however, if such a compression algorithm is used, the system becomes proprietary and therefore not compatible with other vendors. There is currently no standard which supports fractal compression of images.

3) *Software Database* - The HANC system software was developed in C++ under the OS/2 operating system. The software allows the patient to store and retrieve diagnostic information as well as send the information to the central station. In addition, the software supports image capture, compression, storage and forwarding to the central station. The future of the OS/2 operating system is uncertain and experience has indicated that it is riddled with bugs. No standard database software was used to develop a patient record. It would appear that a standard database front-end such as Paradox or Access could be used to link with an Oracle database at the central station and would operate under a Windows environment.

4) *Diagnostic Instrumentation* - HANC currently supports the monitoring of blood pressure, heart and lung sounds, ECG, and temperature. It was suggested that HANC could support any diagnostic instrument that has an RS-232 port. While this is probably true in the long run, it is not as simple as it was made to sound. For each diagnostic device added, software must be developed to interface with the device, acquire data, store the data, and display it in a meaningful form.

5) *Patient Education* - HANC currently supports assisting patients in remembering to take medication and in performing diagnostic procedures. While HANC does not support patient education from a clinical information standpoint, the addition of a CD ROM and extended software capabilities could allow for this type of patient education. Additional work in increasing the bandwidth would allow for patient-specific data to be transmitted over the telecommunications link.

6) *Image Capture and Camera Control* - HANC employs a relatively low resolution camera

(240 X 480 - 12 bit color) that is mounted on a goose neck. The patient positions the camera and then backs away to take a still image. Voice recognition would be an ideal means for the patient to interact with and control the system; otherwise the patient must remain far enough from the camera to be within the field of view, yet near enough to press a key or touch the screen while remaining still: a difficult task for anyone.

7) *User Interface* - The prototype HANC system supports a touch screen for patient interaction. Text-based icons were used to direct the patient to obtain information or perform a diagnostic procedure. Health Tech representatives stated that voice recognition would be added to the system and would be the preferred method of interaction. They indicated that this would be a speaker independent system and would be accurate enough for home use. This is a bold statement given the state-of-the-art in voice recognition systems. Although much progress has been made over the past several years, voice recognitions systems are not 100% accurate and will often times misinterpret the command if it is not said exactly as before. This is especially true with speaker independent systems with large vocabularies. We must be sensitive to this fact and consider the chance for failure and the patient's subsequent frustration with the system. If the commands are chosen carefully and the patients do not have a significant accent, then the voice recognition interface approach may work well. In addition to its potential for being unreliable, voice recognition will add considerable cost to the system.

8) *Multi-point Conferencing/Support Groups* - HANC currently does not support this.

H.E.L.P. Innovations, LC - Resource Link

Representatives from H.E.L.P. Innovation were joined by representatives from Kansas Innovation, Corp., an economic development, state-funded organization. A brief overview of the proposed Army funded effort was given by representatives from Georgia Tech and Ft. Gordon. Ms. Roman then presented an overview of the company, its inception, current status, and relationship to Kansas Innovations. Resource Link is currently being used to monitor elderly patients in a nursing home and home environment. The University of Kansas is using this system in a pilot project in which four homes are connected to a central station located at a hospital. Ms. Roman indicated that the system could be available within 90 days from the time an order is placed.

Resource Link provides real-time, two-way audio and video between the home-bound patient and a central station. This is achieved via the CATV coaxial cable system which requires close cooperation with the local cable company in outfitting its central office for two-way audio and video. The hardware required to achieve this was not discussed but would most likely be similar to what Jones Intercable plans to have available for our demonstration project. Resource Link is heavily dependent on audio/video and does not currently have a data path. Any diagnostic information is either read off the instrument by the patient or shown to the attending nurse at the central station. The company is investigating the possibility of presenting data over the horizontal blanking interval of the video signal as is currently done in transmitting closed-caption data on a television screen. This may present an acceptable solution for interfacing with diagnostic devices and transmitting data back to a central office. It could also be used for transmitting patient specific or general data to individuals at home, although such transmissions would be slow.

Resource Link is not currently a PC-based system so the ability to access or transmit data

is limited to only what can be presented with video and audio. The patient has no ability to interact with screen. A database has been developed for the central station to chart patient information; however, an attendant is required to enter the data manually. As the patient presents diagnostic data to the attendant, either through reading off the digital value or holding the device up to the camera, the attendant keys the data into a PC-based database. Issues regarding Resource Link that are relevant to our project are listed below.

1) *Two-Way Audio/Video* - Resource Link supports high quality two-way audio and video via a CATV connection. They support picture-in-picture such that one can see what they are transmitting and receiving simultaneously. They currently do not support a data path which is a limitation for our application, especially if we are using a diagnostic instrument that does not have a digital display of the result. Representatives indicated that they are addressing this issue by exploring the possibility of coding the data path within the video signal.

2) *Architecture* - Resource Link supports any video camera and monitor system that could be placed into the home. From this perspective, it is an open architecture system and the use of an in-band CATV data path would also conform to standards since this path is frequently used for closed caption data. Any modifications to the system as a result of adding a PC for data capture, storage and tracking can be done such that the system conforms to current standards. On the other hand, there are very few teleconferencing/telemedicine systems currently on the market (Data Point) that handle video in the same manner; therefore, only a limited number of current systems are compatible with Resource Link. Future modifications could correct this, particularly if ethernet over CATV is used rather than analog video.

3) *Software Database* - A software database exists only at the central station and patient information must be entered manually. The in-band data path that is currently being investigated could provide a link to this database. The database at the central station could be enhanced such that patient specific or general information could be made available to the patient though audio and video paths. This database is PC-based; however, it is not known which language was used to develop the database and how easily expandable it is.

4) *Diagnostic Instrumentation* - Any diagnostic instrumentation which has a digital readout is supported through the video link. The patient is required to read the digital value or to hold the device up to the camera so that the attendant can read the value. Currently, the system has been used for monitoring Temperature, Pulse, Blood Pressure, Blood Glucose Level and Weight. This is not an automated process and therefore is cumbersome for the patient and attendant. There is currently no method for supporting diagnostic instrumentation that does not have a digital readout.

5) *Patient Education* - This is not currently being supported by Resource Link; however, the PC system at the central site could be modified to transmit general or patient specific information to the individual. This could be achieved by adding a CD ROM jukebox with specific CDs prepared for particular illnesses. The attendant would select which information to transmit and the appropriate audio/video sequence would be selected from the prepared CDs and transmitted to the patient. There is currently no capability for the patient to select the desired information.

6) *Image Capture and Camera Control* - Image capture or remote camera control is not currently supported by Resource Link. Image capture could be achieved by adding an image capture board to the central station's PC. Software would be required to direct the computer to perform the image capture and store the image in the database linked to the patient. Since Resource Link provides an NTSC video link at full motion (no blurring of the image), a captured image should be of sufficient quality to perform some diagnosis although NTSC is not considered a high resolution image format.

7) *User Interface* - The home-based Resource Link system does not support a user interface. The patient is notified by a series of beeps when a connection is being established by the remote attendant. A platform at the patient site for developing a user interface does not currently exist. The capability for the patient to contact the central office and request a video teleconference is accomplished via a regular phone call. In the event that the patient experiences and emergency, a remote alert device will call the central office directly.

8) *Multi-point Conferencing/Support Groups* - Resource Link does not currently support multi-point conferencing.

American Telecare, Inc. - PTS100S

Representatives from American Telecare included Dr. Khalid Mahumud and Joleyn Young. The meeting was begun with a presentation by Dr. Mahumud regarding the product, status of the company, market decisions, and direction. This was followed by a demonstration of their complete system connected between conference rooms. Representatives from Georgia Tech and Ft. Gordon then discussed the proposed project identifying potential applications which the PTS100S may fulfill.

PTS100S is a video phone based system with a standard analog phone connection between the home-bound user and the central station. The system is based around the MCI video phone which is supported by a vacuum formed module incorporating diagnostic instrumentation and an external speaker and microphone. Currently the PTS100S supports an electronic stethoscope (proprietary) and a blood pressure cuff although a separate analog phone line is required. Any diagnostic instrument having a readout can be supported by having the patient read the value or hold the device up to the camera. The video phone can transmit live video, although very slow, as well as capture and forward images. The video screen is very small and difficult to see (approximately 3.5" X 3.5").

The PTS100S system is currently being used in 10-15 homes primarily in monitoring diabetic patients. A special adapter attaches over the camera to magnify the image as well as to hold a syringe so the remote attendant can observe the amount of insulin drawn into the syringe. Admittedly, the camera image is poor and could not be used for diagnostic procedures involving small lesions. The company's position is that further enhancements in the system would add significantly to the cost thus rendering the system cost prohibitive. The system's cost is approximately $4,500. The company intends to sell the system to health care providers who will establish a network consisting of a central station and patient homes.

Internal research efforts are focused on removing the requirement for a second phone line

to support the electronic stethoscope. In addition, Dr. Mahumud indicated that they intended to support a data link between the home and the central station as well as provide the capability to display video on a PC monitor at the central station. American Telecare is cautious however regarding modifications that would add to the cost of a home-based station.

Calls to the patient's home are scheduled throughout the day. Should the attendant call and the patient not respond, the external speaker and microphone are activated after 8 rings so that the attendant can correspond by voice. The sensitivity is such that the attendant should be able to hear the patient located in another room possibly calling for help.

1) *Two-Way Audio/Video* - PTS100S supports this through a standard video phone provided by MCI. Since the video is transmitted over standard analog phone lines, the quality of the video is poor (8-10 frames/second). In addition, the video screen is extremely small and therefore difficult to see. No plans were expressed for upgrading the video at the home-based station; however, they intend to display video on a PC monitor in the near future.

2) *Architecture* - The system uses a standard telephone line for transmission; however, in order for the patient and attendant to share video, a PTS100S system must exist at each site. The MCI phone uses a proprietary algorithm for compression and decompression and therefore could not communicate with standards-based video conferencing systems.

3) *Software Database* - An extensive software database has been developed for the central station using Microsoft Access, a Windows-based database program. Extensive menus have been developed such that patient data can be entered, stored and tracked. In addition, the PTS100S has approximately 75 guidelines for providing treatment in the home.

4) *Diagnostic Instrumentation* - PTS100S currently supports any diagnostic instrument that has a digital readout. The patient must hold this up to the camera or read the value to the attendant. In addition, a proprietary electronic stethoscope is provided but requires an additional telephone line for use. Standard equipment supplied with the base PTS100S system consists of a MCI video telephone, electronic stethoscope, blood pressure cuff, and an external speaker and microphone. American Telecare indicated plans for providing a data path; however, this would be primarily for transmitting data from the central station to the patient. There were no indications that American Telecare was interested in efforts to provide automatic data collection and transfer to the central station.

5) *Patient Education* - The subject of patient education is not addressed by the PTS100S. This concept was not discussed with representatives, although the presence of a data link might make it possible to transmit general or patient specific data to the individual. Even with this capability, it is doubtful that the patient could read the information due to the small screen. The presentation of video instruction on the screen would be more distracting than helpful due to its poor quality.

6) *Image Capture and Camera Control* - The PTS100S does support the capability of capturing video images and transmitting them to the central station. The image capture is actually performed at the central station which requires that the remote attendant position the patient,

via voice commands, in front of the camera and then take an image. The image quality is poor and can only be used for viewing gross lesions or posture. Since there are no plans to move away from the video telephone, improvements of this function are unlikely.

7) *User Interface* - The user interface at the home site is cumbersome due to the small screen size. If one wants to view a syringe, a special adapter must be placed over the camera to magnify the image. There does not exist a software database allowing the user to select options at the home site. The central site consists of a PC-based database with well structured patient records. These records appear to be easily accessible; however, all information must be entered manually.

8) *Multi-point Conferencing/Support Groups* - PTS100S does not support multi-point conferencing.

Recommendation

Discussions during the development stage of the proposal focused on live two-way audio and video interaction with the home-bound user. Initial design plans were presented which utilized a Sun workstation with a cable TV-based ethernet connection. Due to the fact that a Sun or Silicon Graphics Workstation was initially specified, software development was to be done in X-Windows, a graphical programming environment, to allow the user to interact with the system. Jones Intercable had agreed to outfit their central office such that two-way audio and video was possible using ethernet. Off-the-shelf diagnostic instrumentation would be interfaced to the Workstation through serial and/or parallel ports. The resulting system would be capable of interfacing with diagnostic instrumentation having a serial or parallel interface, transmitting real-time two-way audio and video, collecting and cataloging patient data, providing the patient access to general as well as patient specific information, and would be controlled via a graphical user interface. The integration of off-the-shelf diagnostic instrumentation would be accomplished by GIT and Andries Tech using equipment provided by Andries Tech. The development of a graphical user-friendly interface would be accomplished by GIT and AND, Corp.

The discovery of several companies currently providing home health delivery via telecommunications indicated that we should seriously investigate systems that are being used and look at the potential for rapid deployment of one of those systems with subsequent development efforts to advance the state-of-the-art. It was not anticipated that one company would have all of the capabilities that we desired in an end-product; however, the existing product would provide a platform onto which we could build. The possibility of involving the telephone companies in this endeavor as well as the cable companies presents an attractive arrangement. Our primary goal is to provide quality health care in the home without concern for the type of telecommunication link; however, the link used must be capable of reaching a majority of the population. Since telephone lines extend into almost every home, they are an attractive communication link; however, telephone lines are limited to very low bandwidth and therefore poor quality video and slow data channels for transferring patient information. On the other hand, cable TV is fairly widespread, although not as widespread as telephone service, and offers a tremendous improvement in bandwidth. This improvement in bandwidth makes possible high quality video and the ability to communicate general as well as patient specific information quickly.

The consortium must investigate both telephone and CATV based communications technologies for providing quality health care in the home. This makes sense from both a practical standpoint due to the capabilities and limitations that each technology affords and a political standpoint to position Georgia in the forefront of home health care delivery. To this end, our recommendation is that we pursue a working relationship with both Health Tech and H.E.L.P. Innovations. It is believed that rapid deployment of both systems can be achieved and that improvements in both systems would substantially advance the state-of-the-art. Health Tech's goal, with direction and assistance from the consortium, would be to improve upon the software currently developed to allow for access to general and patient specific information, to allow for better presentation and tracking of diagnostic information, to develop a more attractive user-friendly interface, and to increase the bandwidth capability including support of CATV. H.E.L.P. Innovations' goal, again with direction and assistance from the consortium, would be to improve upon current audio and video capabilities by adding a PC-based interface to diagnostic instrumentation, adding an in-band data path for transmitting data, developing a graphical user-friendly interface for collection, storage and tracking of patient information, and developing an interface for retrieving general and patient specific information. Additional efforts on both fronts would center around providing multi-point capabilities to allow for patient "support groups" in the form of multi-point conferencing.

EHC Project Review Meeting Slides

ELECTRONIC HOUSE CALLS

PROJECT REVIEW MEETING

November 29, 1995

MEDICAL PARAMETERS

- EKG Rhythm Strip
- Electronic Stethoscope
- Pulse Oximetery
- Blood Pressure
- Temperature
- Weight
- Spirometry
- Blood Chemistry
- Doppler Ultrasound

MEDICAL DEVICES

- Dynamap - Johnson & Johnson - $6,300
  - Blood Pressure
  - Pulse Oximetry
  - Heart Rate
  - ECG
  - Temperature
  - RS-232 Computer Interface
- LifeWatch - Ralin Medical - $1,000
  - ECG Wrist Watch Device
  - Heart Rate
  - RS-232 Computer Interface
- Onyx - Nonin - $350
  - Pulse Oximetry
  - Heart Rate
  - Visual Display of Parameters

MEDICAL DEVICES

- PALCO/8500- Nonin - $600
  - Pulse Oximetry
  - Heart Rate
  - RS-232 Computer Interface
- HealthDyne - ?
  - Pulse Oximetry
  - Heart Rate
  - Parallel Computer Interface
- DynaPulse - $800
  - Blood Pressure
  - Heart Rate
  - PC board with automated pump
- ThermoScan - $75
  - Temperature (Tympanic)
  - Visual Display of Temperature

MEDICAL DEVICES

- Andrias Tek
  - Electronic Stethoscope
  - Cardiac and Lung Sounds
  - Analog Input to Computer
- Stethocom II - MTI
  - Electronic Stethoscope
  - Cardiac and Lung Sounds
  - Analog Input to Computer
- TelePhonic Stethoscope - American Telecare - $1,500
  - Electronic Stethoscope
  - Cardiac and Lung Sounds
  - Analog Phone Line

AUDIO/VIDEO TELECONFERENCING

- Intel ProShare - $2,550
  - Ethernet Support (ISDN Support Optional)
  - Limited to 400Kbps (Equivalent to 128Kbps ISDN)
  - Provides Software Developer's Tools for Third Party Applications
  - Includes:
    - CODEC Card
    - Audio "Call Port" Speaker/Microphone
    - PCI Accelerated Graphics Card
    - Ethernet Card
    - Low Quality Camera
  - Picture-in-Picture Capability
  - Integrated Document and Application Sharing
  - Integrated Still Image Capture

AUDIO/VIDEO TELECONFERENCING

- ImageLink - $4,750
  - Ethernet and ISDN Support
  - Limited to 2Mbps
  - Provides Software Developer's Tools for Third Party Applications
  - Includes:
    - CODEC Card
    - Speaker/Microphone
    - Video/Graphics Overlay Card
    - Ethernet Card
    - Low Quality Camera
  - Picture-in-Picture Capability
  - Third Party Document and Application Sharing
  - Third Party Still Image Capture

VIDEO SYSTEM COMPARISON

• Intel	• ImageLink
Image Quality	✓ Image Quality
Audio Quality	✓ Audio Quality
✓ Cost ($2,550)	Cost ($4,750)
✓ Software Tools	✓ Software Tools
✓ Document Conferencing	Document Conferencing
✓ Market Share	Market Share

MEDICAL DEVICE COMPARISON

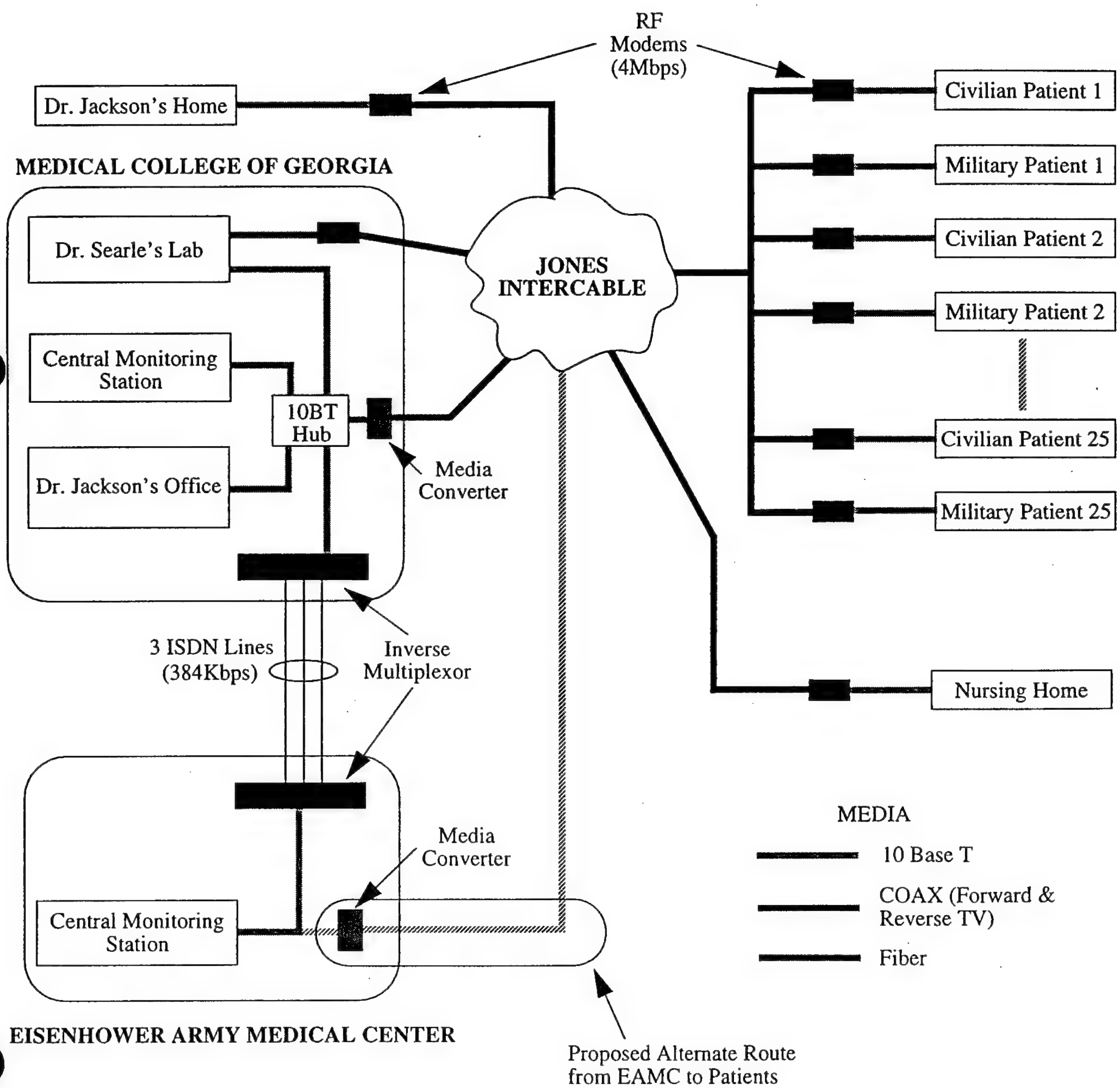
• Critikon	• Component
Ease of Use	✓ Ease of Use
Cost ($6,300)	✓ Cost ($2,475)
✓ Quality	Quality
✓ Computer Interface	✓ Computer Interface
Footprint	✓ Footprint
✓ Market Share	Market Share

SYSTEM CONFIGURATION

• Desktop or Minitower Multimedia PC – INTEL 120MHz Pentium Processor – 32MB RAM – 1.6 GB Hard Drive	$ 3,275
• Proshare Audio/Video Conferencing System -	$ 4,750
• Johnson & Johnson Dynamap System -	$ 6,300
• Zenith RF Modem -	$ 500
• Software (Database, Communications, etc.) -	$ 200
• Cabinet -	$ 250
Total	$15,275

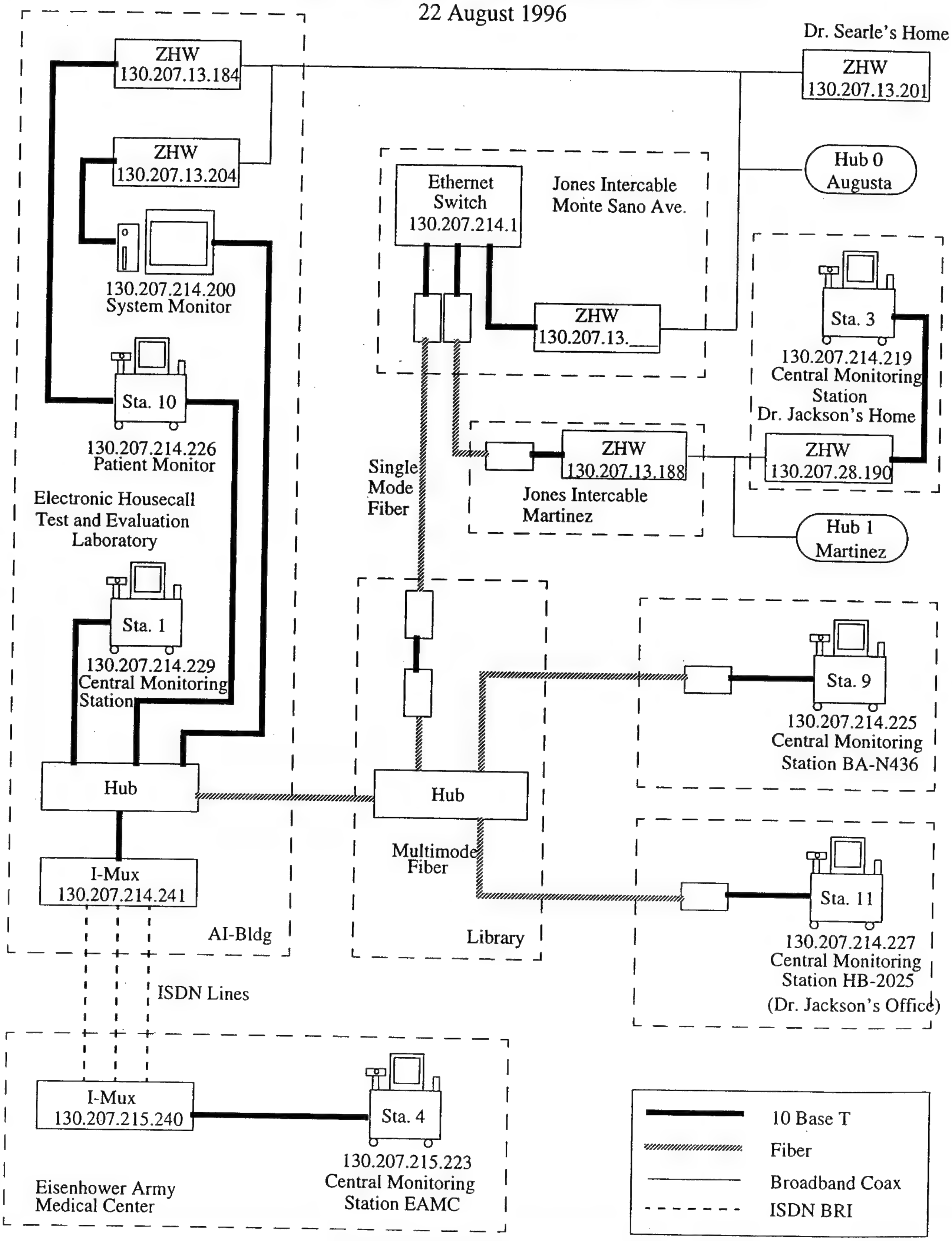
ELECTRONIC HOUSE CALL

NETWORK OVERVIEW

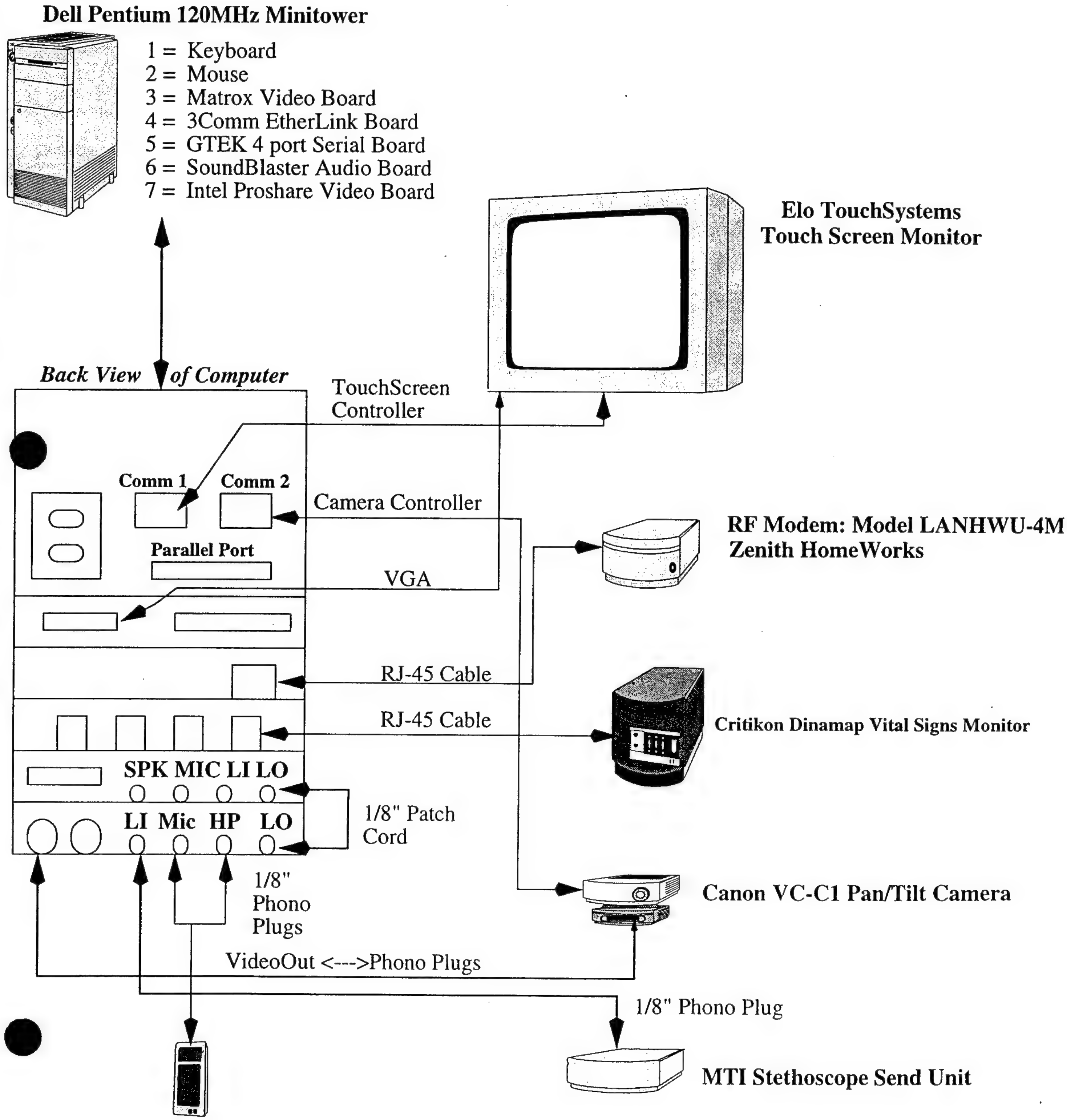


DETAILED NETWORK DIAGRAM

22 August 1996



ELECTRONIC HOUSE CALL
HOME STATION



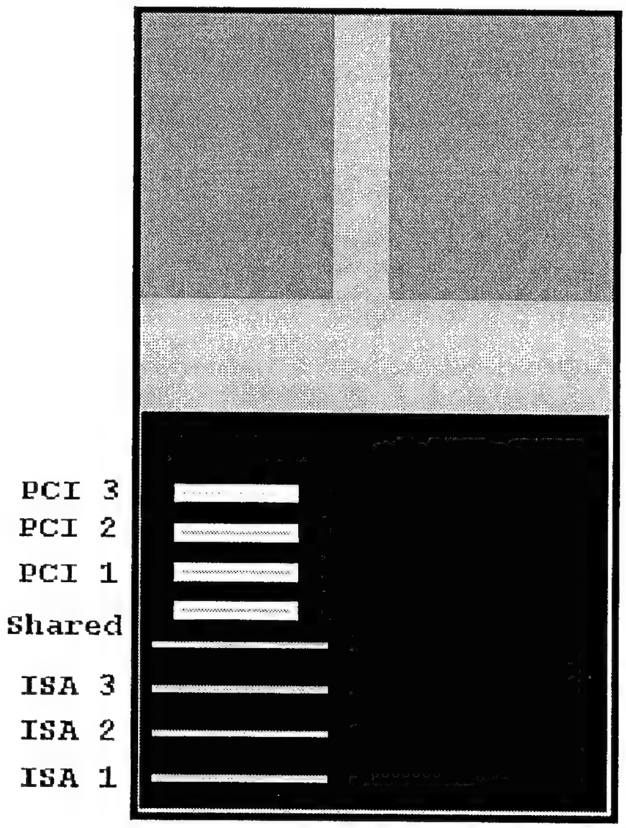
INSTALLATION OF ELECTRONIC HOUSE CALL

1. General :

- Record all parts on serial number checkout list.
- Save all extra parts and documentation in the box the Dell extras came in.

2. Install Boards:

- Remove the existing video board from the computer. Add extra RAM, if necessary, up to 32M total.



PCI 3 - Empty

PCI 2 - Matrox video board

PCI 1 - 3com Etherlink III board

Shared - GTEK serial port board (client/patient machines only)

ISA 3 - Sound Blaster 16 board

ISA 2 - Empty

ISA 1 - ProShare Audio/Video board

3. Set up GTEK board (client computer only):

- Port Addresses 100-120 - verify jumpers at JB6 to look like this: [] : []
- Shared IRQ 7 - Set the jumper group at the bottom of JB1 (OR gate output) to 7.
- Remove reset switch cable from motherboard (blue/balck twisted pair). Plug it into the first 2 points on JB2 (outside corner).
- Using red/black 15” cable supplied, connect other 2 pins of JB2 to the reset pins opn the motherboard (top front corner). Polarity does not matter.

4. Install Touchscreen Monitor :

- Connect the monitor to the display adapter (Matrox), connect the serial connector of the monitor (touchscreen cable) to COM1, connect AC power cord.

5. Install Windows 95 if not pre-installed:

• Boot up machine. Verify the computer is working correctly and the 'NUMBER9' error. From DOS prompt -

- Go to the windows directory, type SETUP and change the display adapter to VGA. Press Enter, Enter.
- Edit the Windows file C:\WINDOWS\WIN.INI and remove all references (the rest of the line) after the "load=" and "run=" lines in the "[windows]" section, so that there is a blank after each equal sign.
- If a client/patient machine, create GTEK directory under the C drive and copy WDOG.COM into it. Edit AUTOEXEC.BAT to include C:\GTEK\WDOG.COM 100.
- Edit AUTOEXEC.BAT. Remove the three lines near the bottom that contain the dell menu references.
  - rem [DellMenu], rem Ell\Dellmenu.exe, rem [end-DellMenu]
- Run Windows, and enter "BITC" for the name and "MCG/GTRC" as the company. There is no printer attached.
- Insert the Windows '95 disc into the CD-ROM drive. Run D:\WIN95\SETUP.EXE and install Windows '95.
  - Do not save old system files.
  - Choose custom system setup.
  - When the setup program asks you for a CD key, the number is on the back of the sleeve containing the Windows '95 Upgrade disc.
  - **Check** the Network Adapter Box..
  - Allow Windows to search for devices. A list of detected hardware should pop up. OK the component list. On the Network Components menu - add Microsoft TCP/IP as a network protocol. Choose '3COM Etherlink III BusMaster PCI'. Remove 'Client for Netware'.
  - Set the Mouse to standard types - Standard PS/2 Mouse. Set the Monitor to CTX - CTX 1765. Allow the default settings for the rest.
  - You do not need a startup disk. While it is finishing/rebooting, make sure it's hooked up to the net—ethernet connection in 3COM board.
  - The user name is 'EHC-0xx', with no spaces, numbered consecutively. Leave the password field blank.
  - Enable File Sharing in the Network control panel.

6. Network Setup

If, when you restart Windows, it gives you with a message that a DHCP server could not be located, then hit 'Yes'.

- Go to the Control Panel. (Start-Settings-Control Panel) Open Network.
- Enable NetBios communications - double clicking IPX/SPX and clicking the enable NetBios box and hit 'Ok'.
- Double click the TCP/IP protocol. Choose to specify IP address and enter 130.207.214.XXX where XXX is assinged to you. The sub mask will be 255.255.255.0.

Click the Gateway Tab and enter 130.207.214.1 and click 'Add', then 'Ok' (in parent window). Wait until later to restart Windows.

- In the network settings, click the Identification tab. Enter in for Computer Name - "EHC-xxx", for Workgroup - "HouseCall", and for description - patient's name.

7. Install Matrox driver from CD :

- Install Matrox CD-ROM. Choose "Install Win95 Drivers". Choose Control Panel-Display-Settings, and change desktop area resolution to 800x600 with color palette to 24 bit color. In the Screen Saver tab, set the screen saver to "none". Wait to restart Windows again.

8. Install Touch Screen adapter drivers:

- Start- Shut Down and restart in DOS mode option.
- Insert the ELO drivers diskette. From the "C:\" prompt, type "A:INSTALL" Installation is very easy; just hit enter for all defaults until the installation is complete. After installation has completed, type "GO" and calibrate the monitor.
- Insert the mouse disk and copy "MOUSE.EXE" to the C:\TOUCH directory.
- Edit C:\AUTOEXEC.BAT. Change the "SET MOUSE = C:\MOUSE" to "SET MOUSE = C:\TOUCH." (it's near the bottom.). Remove the next line "rem - By Windows Setup - C:\MOUSE\MOUSE.EXE /Q". Then, add the line "C:\TOUCH\MOUSE.EXE" in its place.
- Save file, remove floppy, and reboot the machine. Start-Settings-Control Panel and select Touchscreen. Calibrate the touchscreen again.

9. Install ProShare Video Software

- Goto Proshare directory on CD-ROM. Go into Disk1 folder. Double-click "Setup". Do a complete installation. Do not restart the computer after the installation is complete.
- Run/open 'C:\PSVIDEO\PSVIDEO.INI'. (the INI doesn't show on the desktop.) At the top of the file, insert the lines:
  [PERMISSIONMODE]
  STRICT=0
- Save this file, and open 'C:\PSVIDEO\PSUSER.INI'. At the top of this file, add the lines:
  [AVCS\PERMISSIONMODE]
  STRICT=0
- Save this file, and exit Notebook.
- RIGHT click on the Start button. Choose Open. Double click Programs, then StartUp. Delete ProShare Video - Listening. Get back to the desktop, and delete the Set Up Microsoft Network icon.

10. Install Visual Basic

- Insert the Visual Basic disc into the CD-rom. Double click My Computer, double click the Vb4 (D:) icon. Double click Setup.
- When Setup comes up, click 16 bit Visual Basic (the second button) for name, enter the computer name you entered earlier. (EHC-0xx) For Organization, enter MCG/GTRC.

- Do a complete install.
- Let it install into the default directory.
- Copy help files to your hard drive.
- Use the default group name
- Close setup window and eject CD.

11. Install Proshare Developer's Kit (PDK)

- Reboot Computer.
- Instert PDK CD. Open PDK folder, then 'Setup' (It's hiding to the right.)
  - 'Read license', close notepad and 'Accept'.
  - Don't install sample applications. It's quick and easy.

12. Install Quicktime

- Insert CLIO Awards CD. Open it, and click 'Install Quicktime'.
  - Follow the defaults. It's also quick and easy.

13. Configuration of the GTEK Comm Ports :

- Disable Printer : Start-Settings-Control Panel. Double click on 'System'. Click 'Device manager' tab. Click 'Ports'. Double click 'Printer port'. UNCHECK the 'Original configuration'. Click 'Ok'.
- Restart computer.
- Config ports : Start-Settings-Control Panel-Add New Hardware. Do not search for new hardware. Choose 'Ports'. Use defaults. Finish.
- Repeat last step 6 times or until Comm 8 shows on Device Mangaer. To check if correctly done - Control Panel-System. Click on 'Device manager'. Check the comm ports to see if 8 are listed.
- After the comm ports have been added to the 'device manager', the addresses and interrupts need to be changed.
  - Start-Settings-Control Panel. Double click on 'System'. Click 'Device manager'. Click 'Ports'. Double click 'Comm Port 5'. Click on 'Resources'. Double click 'Input/Output Range'. Set the lower value to 100. Double click 'Interrupt Request'. Set this value to 7. If a message comes stating that this number is already used, click 'OK'.
  - Repeat last step for all comm ports upto 8. The values for the comm ports are listed below.

Comm Ports	**Input/Output Range**	**Interrupt Request**
Communication Port 5	100	7
Communication Port 6	108	7
Communication Port 7	110	7
Communication Port 8	118	7

- Restart the computer.

- Remove Ports : Return to 'System' under Control Panel again. Click 'Device manager'. Click 'Ports'. Click on 'Comm Port 3'. Click 'Remove'. When asked if ok, click 'OK'. Repeat for Comm Port 4.

13.1. Install EHC Software :

- Put in EHC CD-ROM into drive.
- Open EHC folder. It should contain "home" and "hospital" software.
- Copy folders into a path - "C:\EHC\HOME" for Patient system or "C:\EHC\HOSPITAL" for Hospital system.
- Removing Read-Only Priviligies.
- After all the files are copied, go to the appropriate directory (either "HOME" or "HOSPITAL") and "Select All" files from the Edit menu. Go to File menu and then "Properties". UNCHECK the READ-ONLY privilege. Choose Apply and then OK.
- This needs to be done for every folder within either "HOME" or "HOSPITAL". This will ensure that all the files are NOT read-only.
- Restart the system for changes to take effect.

13.2. Setup for FTP :

- Make sure computer is setup for file and print sharing under Control Panel-Network.
- For PMS and CMS : After the EHC software has been installed, click on the 'InBox 'and choose under File-Sharing. Choose 'Shared As' and 'Full' with no password.
- On PMS : Right click on wood-grain bar at bottom - menu should appear. Put correct Hospital IP and under Hosp. Computer name - "EHC-xxx" of hospital unit.
- On CMS : Make sure patients are added to list and under network - add patient's unit # - "EHC-xxx".
- Copy the "LMHOSTS" file under the WINDOWS directory. If there is not one on the CD-ROM, then make a new one from NOTEPAD. The file only contains - "the IP Address", tab, and "the computer name" (example - EHC-0XX), carriage return - for all the systems on the network.
- Restart the computer.

14. Prepare and install the Dinamap :

- Automatic 'on' function: Remove outer casing. Under 'on' button, solder across the surface wires. Replace outer casing, check that it boots up automatically.
- Remove black mounting plate from rear base. Drill holes, screw onto surface using 1/4" spacers. Attach Dinamap to mount.
- Attach adaptor to Dinamap, plug cable into rightmost port of GTEK board.
- Affix diagnostic leads to tray with cable straps; leave space for stethoscope.

15. Initializing the Dinamap :

- Change SpO2 Power-on :
  - In the Main Menu, press the System soft key.
  - Press the Service key.
  - Enter the Service Code numbers: 2, 2, 1, 3.

- Press the SpO2 key. (Observe that the sensor's red/infrared indicators light; this is normal.)
- Press the Default key. (Each Default keypress toggles between standby and operate mode.)
- Power off the monitor; then power on again.
- Verify that the pulse oximetry power-on default is in the intended mode (operate or standby).

16. Stethoscope :

- **Patient/client machines :**
  - If necessary, open send unit case and trim gain potentiometer to appropriate output level.
  - Connect to Line In terminal of Proshare board.
  - Affix stethoscope along with Dinamap leads.
  - Headphones.
  - Install a (1/8" - male stereo cord) into the Line Out of ProShare and into the Line In of SoundBlaster.
- **Central Monitoring Stations:**
  - Connect the receive unit into the Line Out of ProShare.
  - Install the Andreis Tek stethphones into the receive unit.
  - Remove the high frequencies (1kHz and greater). This will remove the noise from the stethophones.

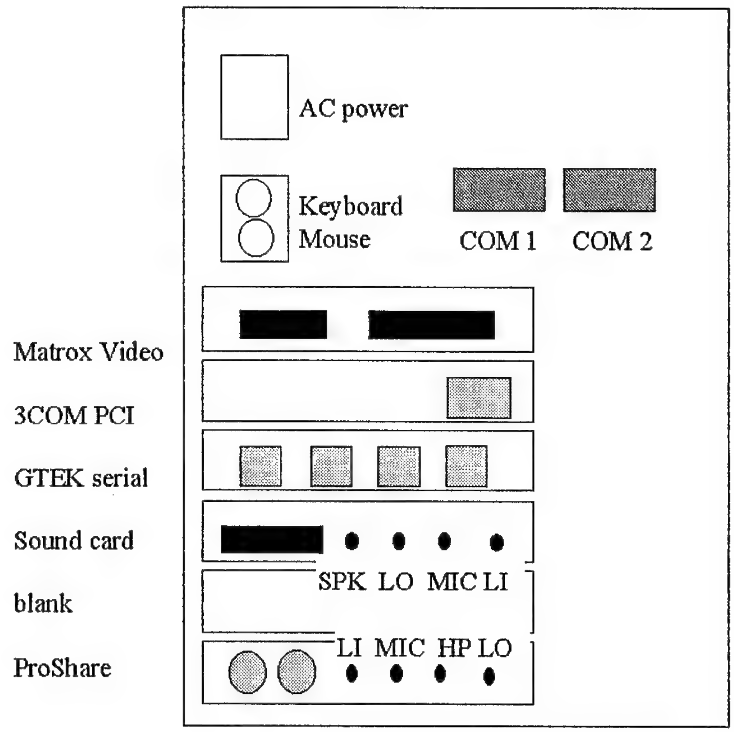
17. Peripherals :

- Open Call Port. Drill holes in base, screw base on far left side of cabinet top, angled slightly toward center. Reattach front; this requires small srewdriver ratchet.
- Open Altec speakers.
  1. Drill 1/4" hole in top of master speaker, at rear center of front half. Screw camera to speaker with 1/4-20 screw.
  2. Saw off part of bass port from rear half of master speaker to make room for screw head.
  3. Drill holes in base of rear half; screw onto cabinet top.
  4. Reassemble speaker.
  5. Repeat 3,4 for slave speaker.
- Cabinet door: Drill, tap (6-32) for hinges. Drill, countersink for closing screws. Attach to cabinet.
- Connections: See diagram.
  - AC power, keyboard, and mouse are obvious.
  - Touchscreen cable connects to COM1.
  - Camera control cable connects to COM2.
  - Add 1/8" stereo headphone jack patch cord between ProShare LO and sound board LI.
  - Monitor cable attaches to Matrox board.
  - Network cable (ethernet) connects to 3COM board.
  - Call Port connects to headphone and microphone jacks of ProShare board.

- Camera connects to leftmost jack of ProShare board, using ProShare cable.
- Altec master speaker connects to SPK of sound board.
- Patch cord for stethoscope in PMS only from LO of ProShare to LI of SoundBlaster.

• Patient sites:
- Dinamap connects to rightmost port on GTEK board.
- Stethoscope connects to LI of ProShare board.

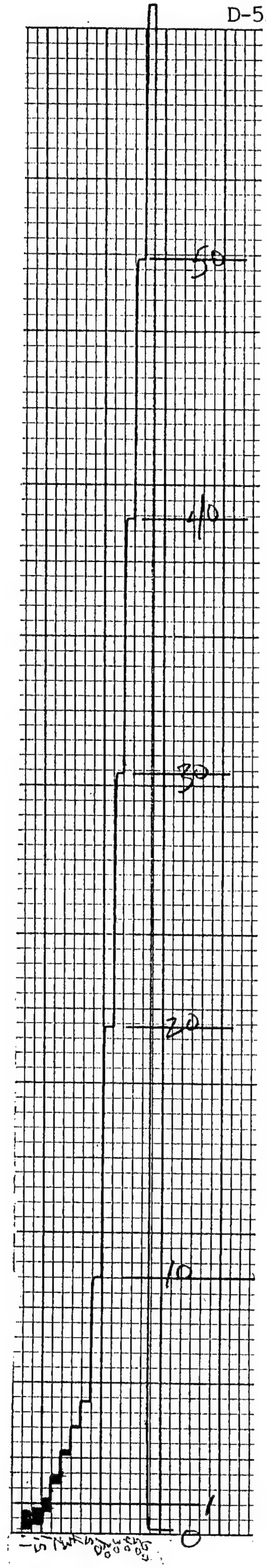
Rear View of Dell Dimension XPS-P120C



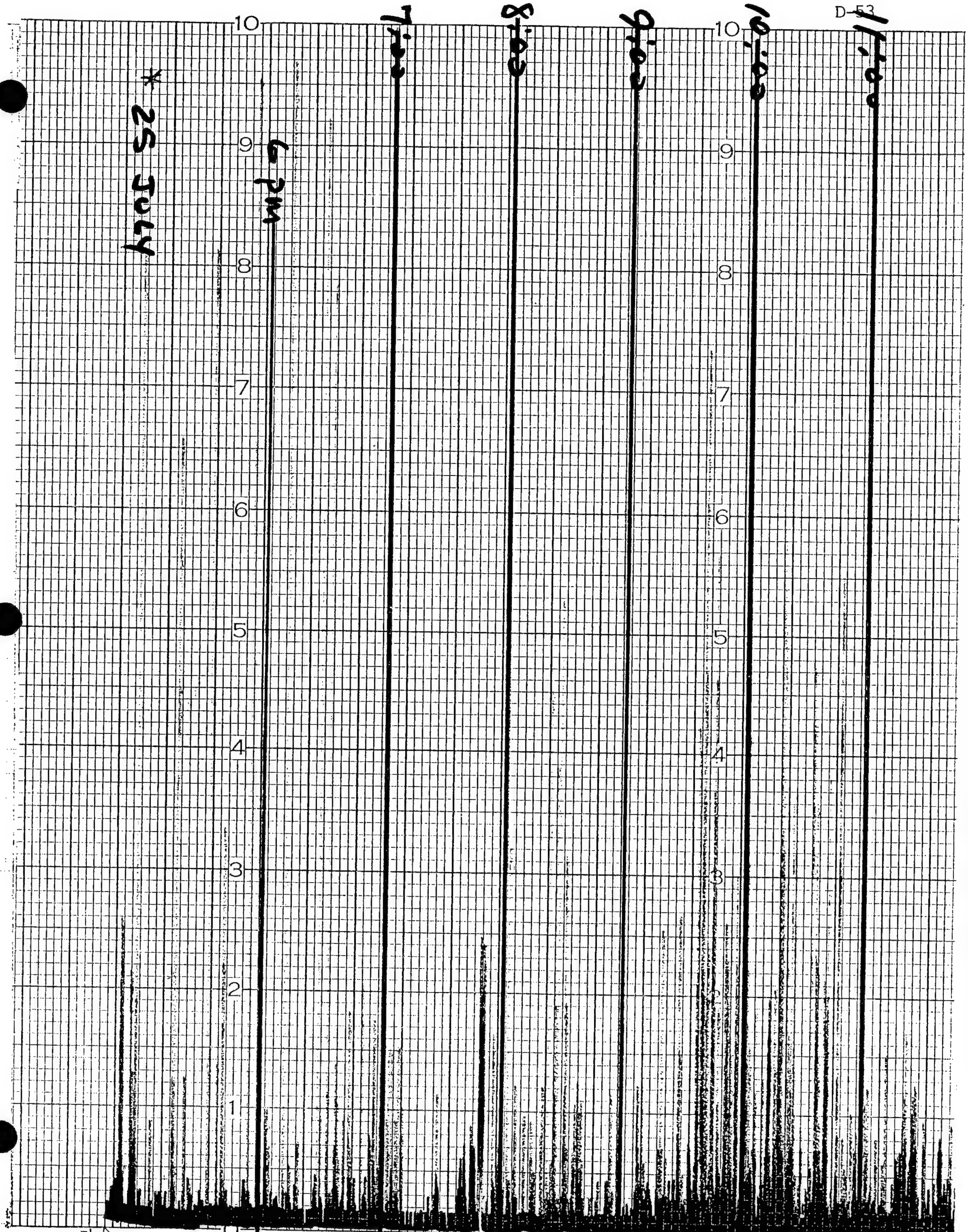
Return Path Noise Bursts

Vertical-axis Calibration: Bursts per Second

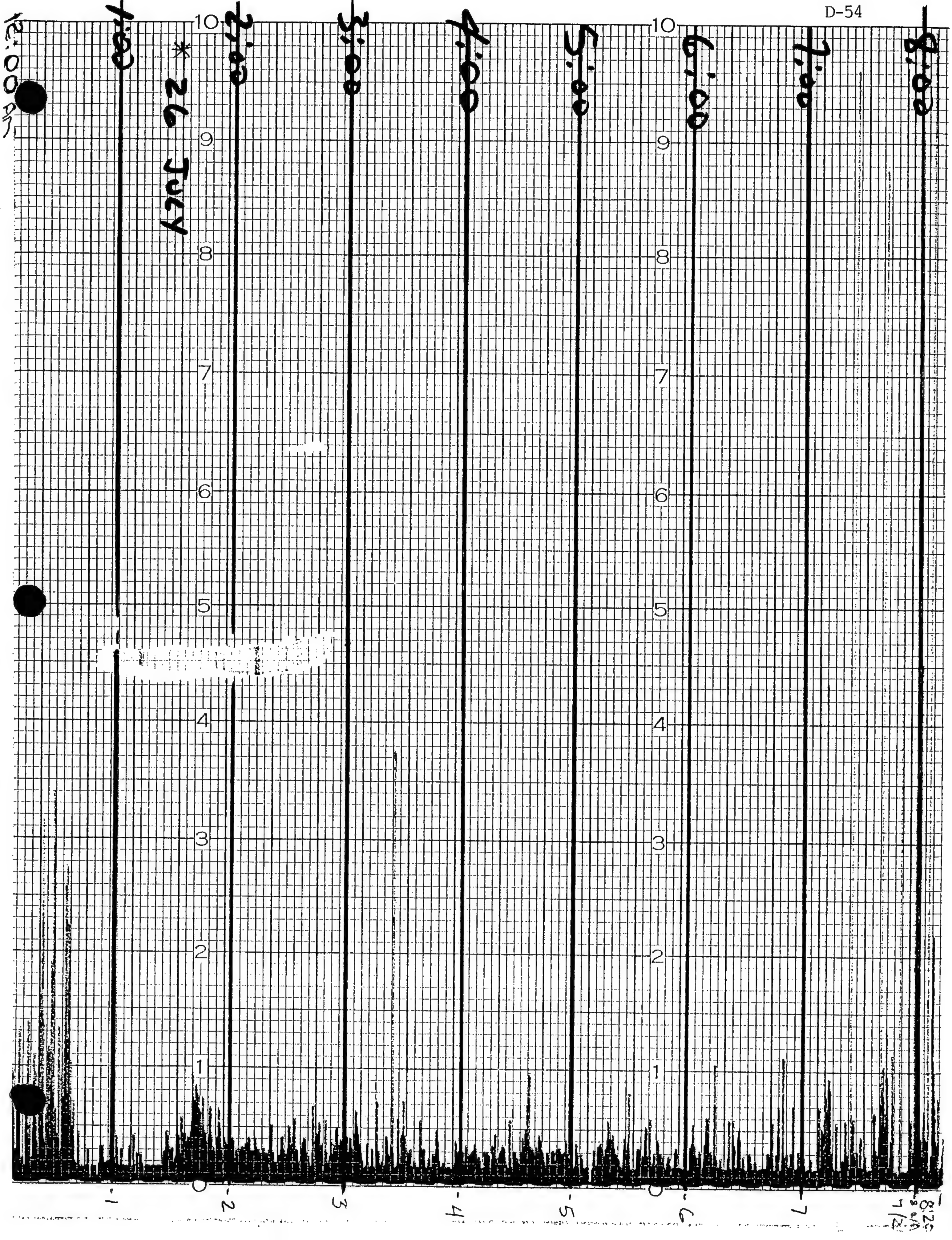
Horizontal-axis Calibration: One Hour = Two Large and Three Small Divisions



D-53



D-54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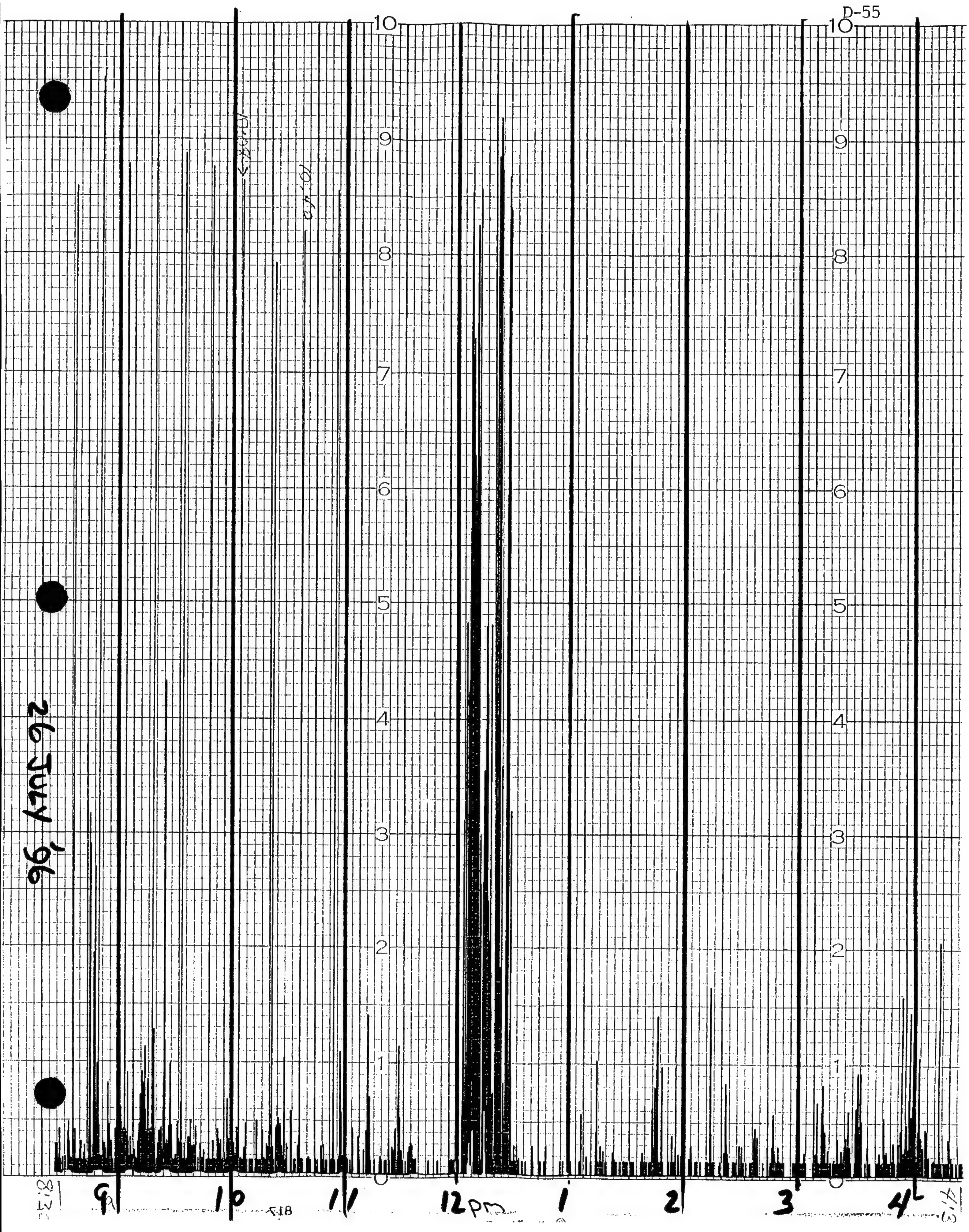

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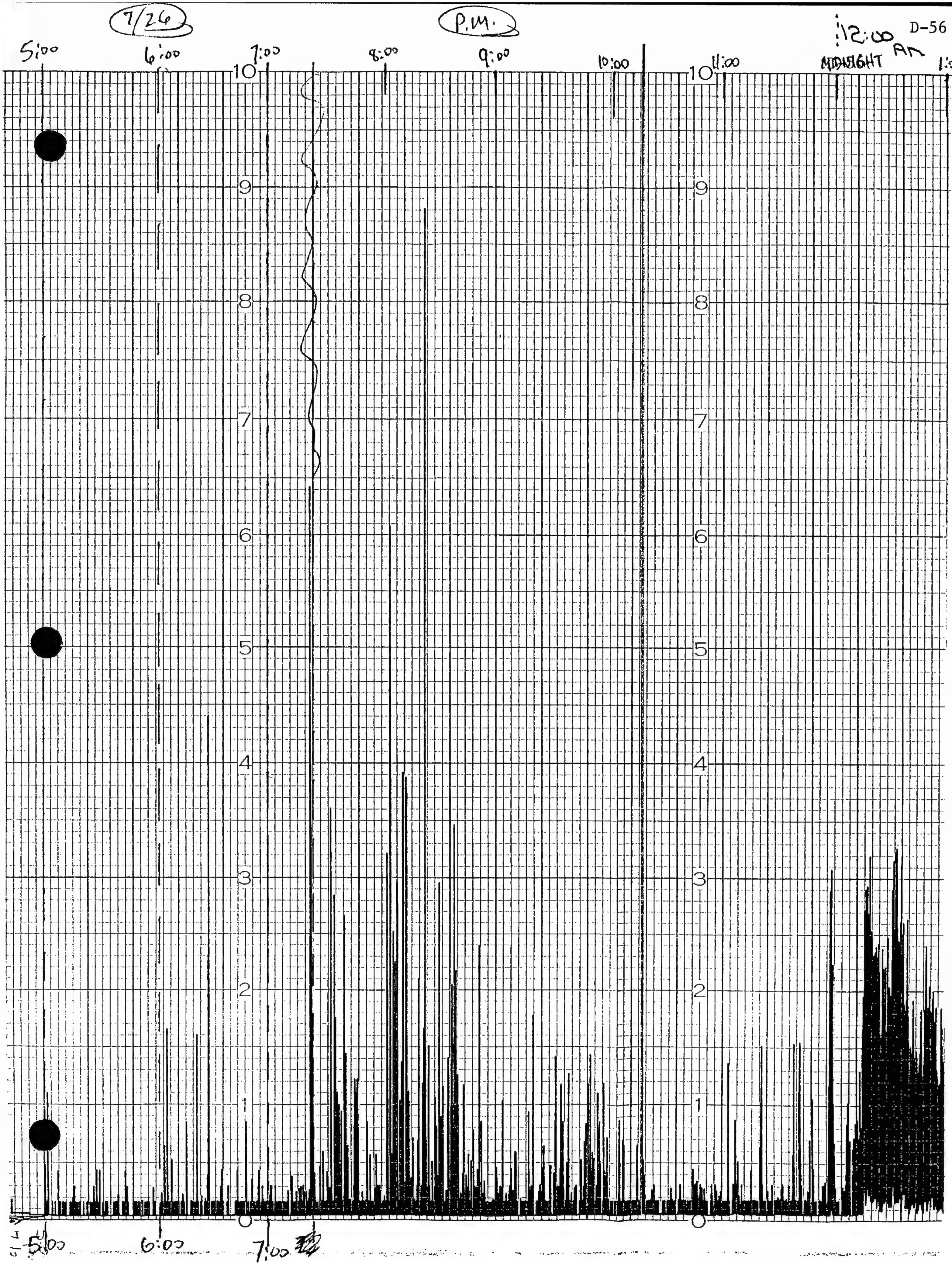
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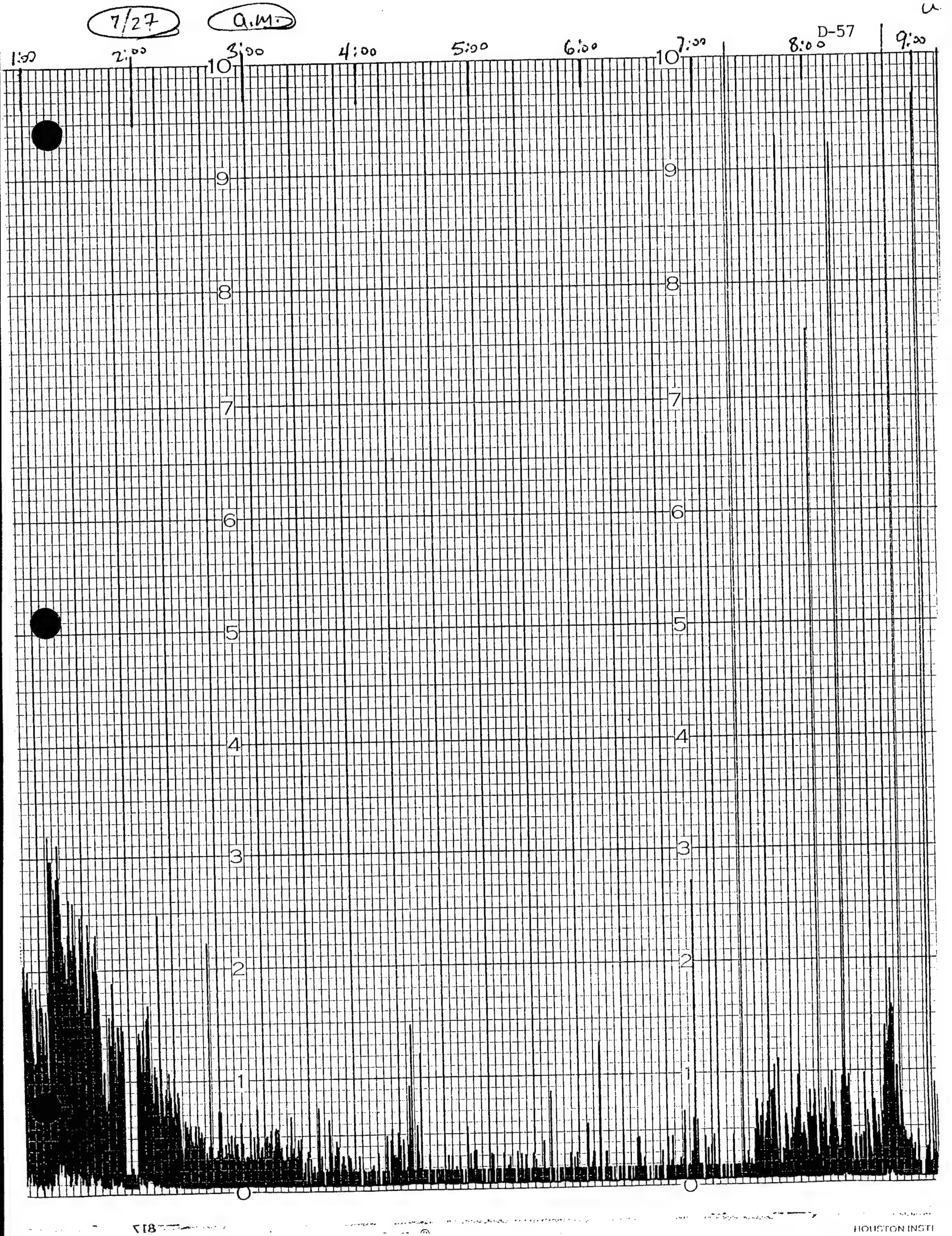
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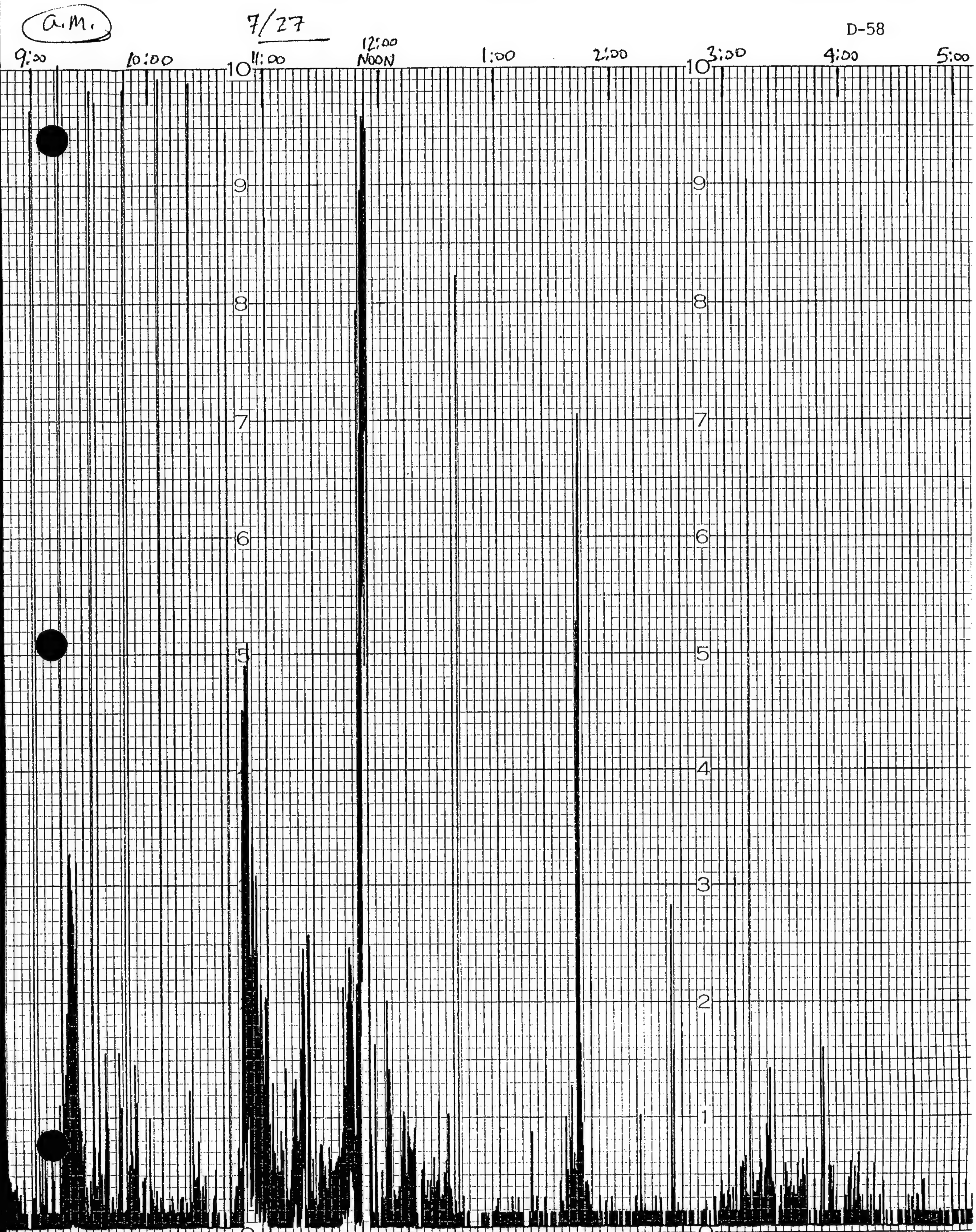
D-58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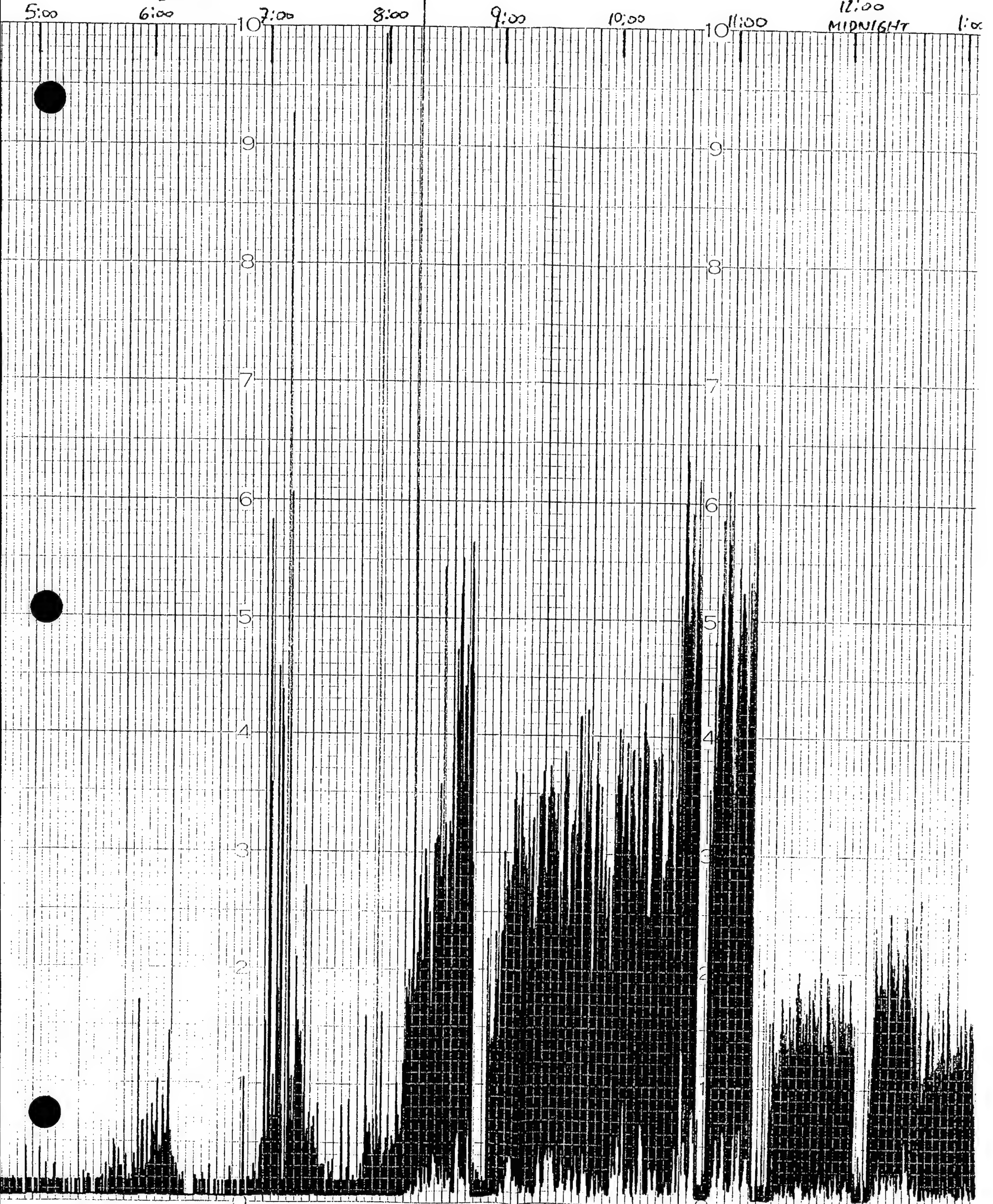
7/27 PM

D-59



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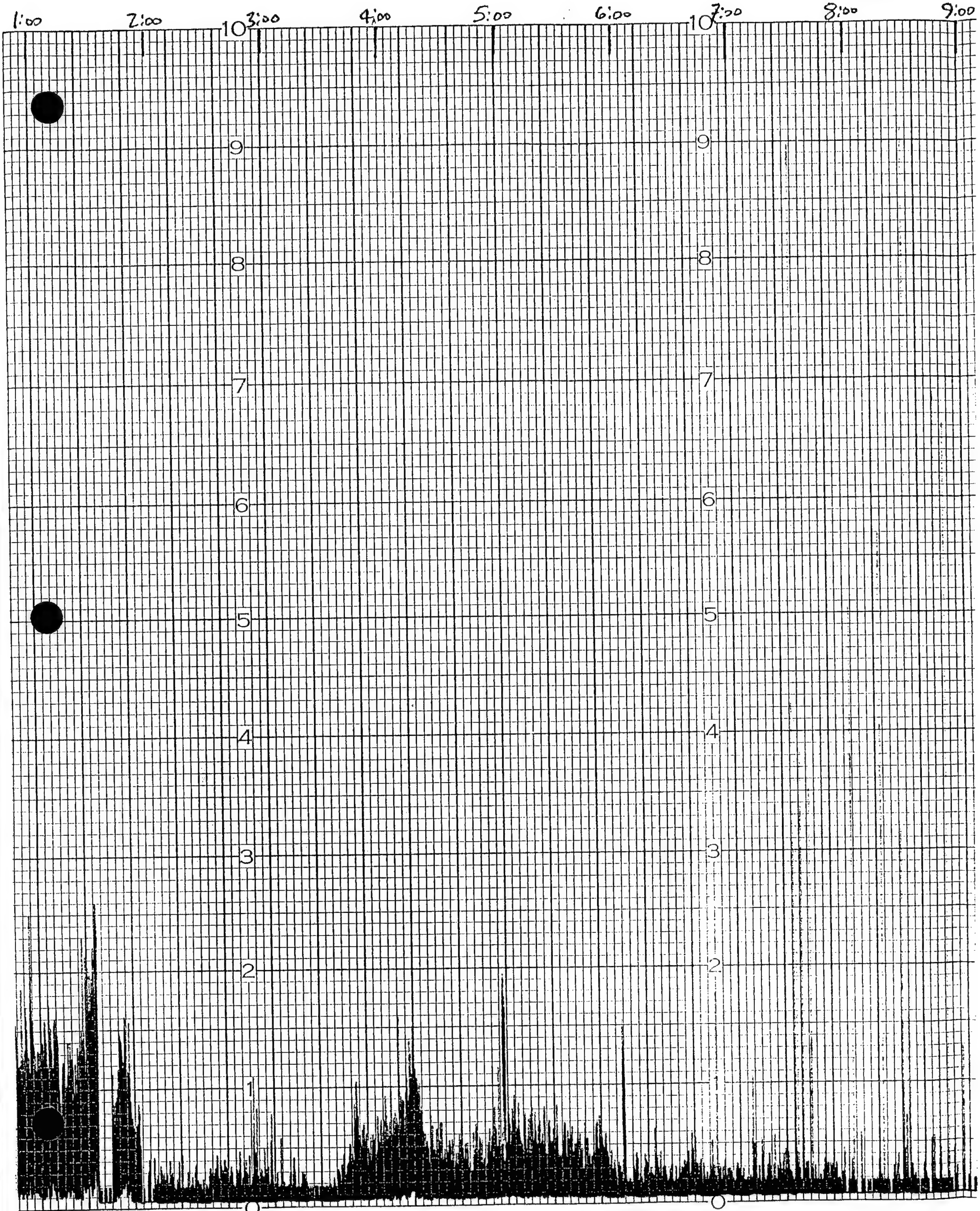
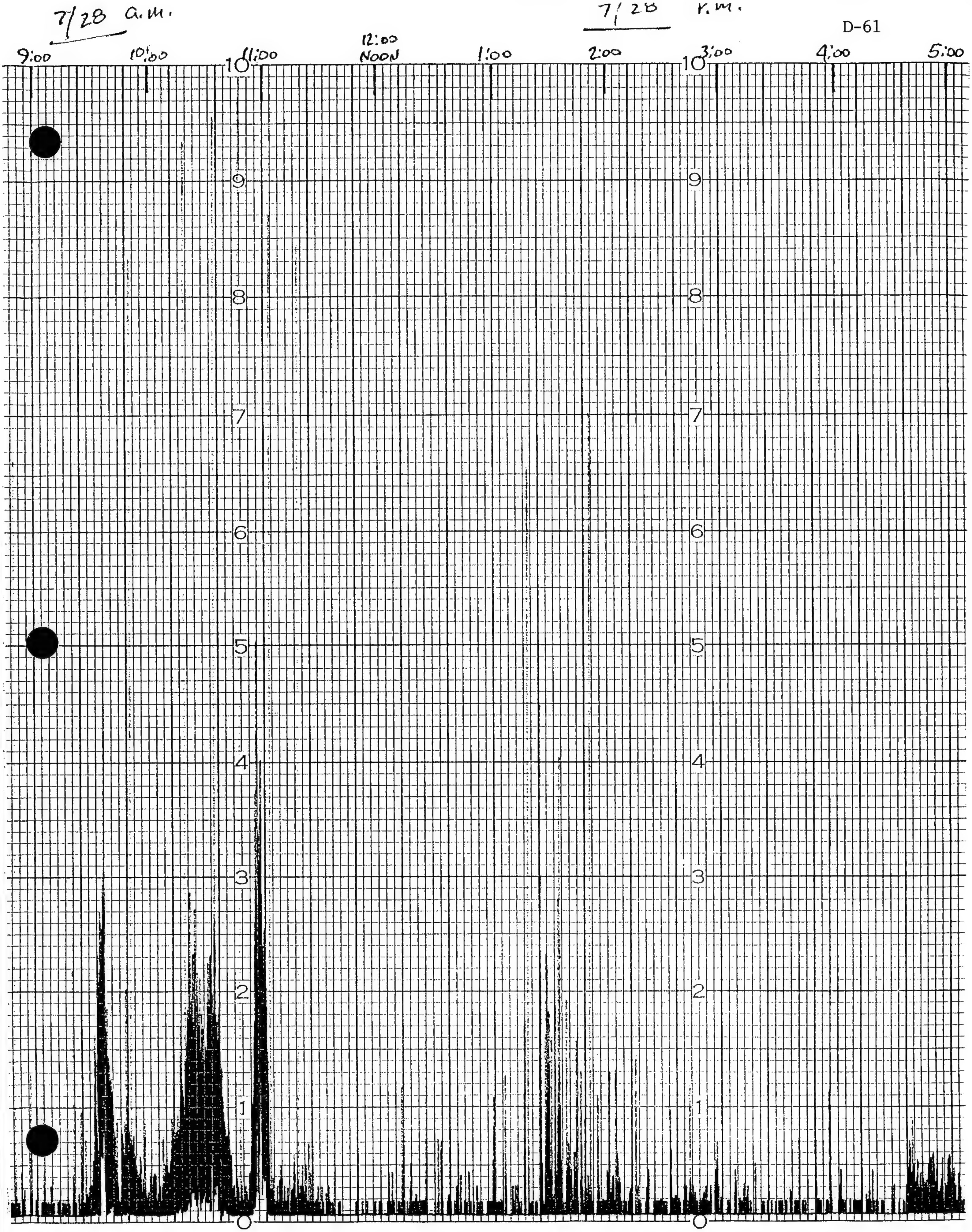
D-60



D-61



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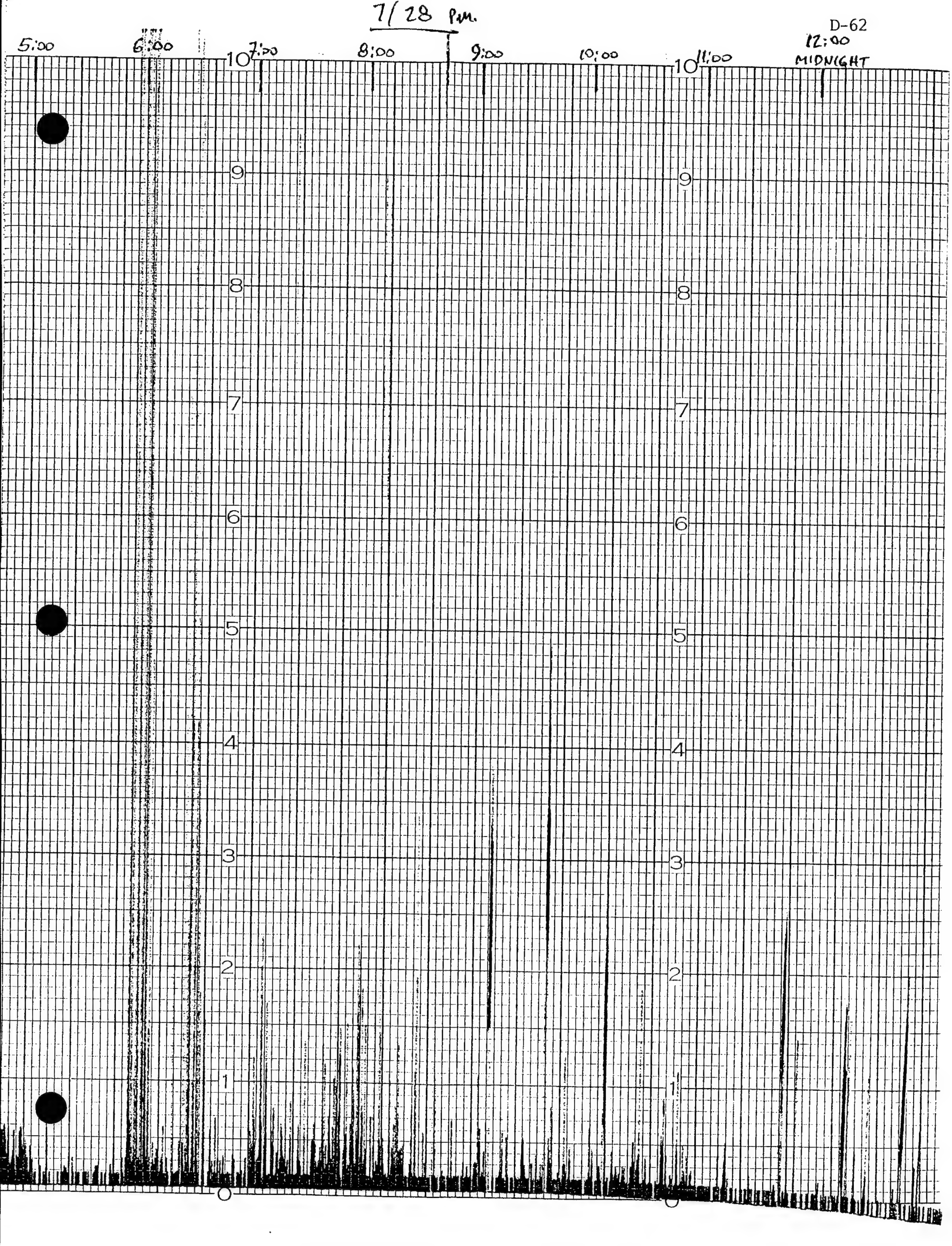

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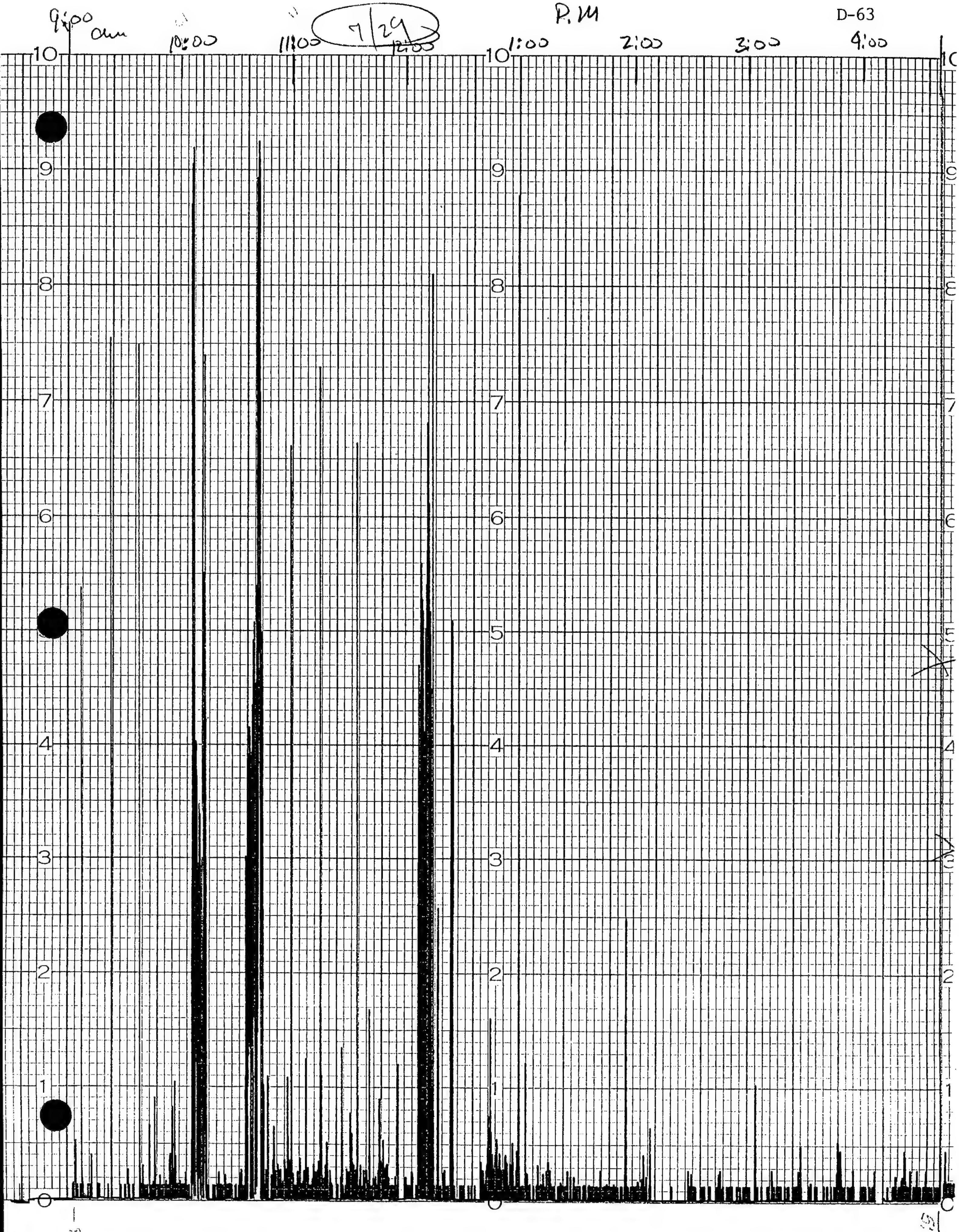

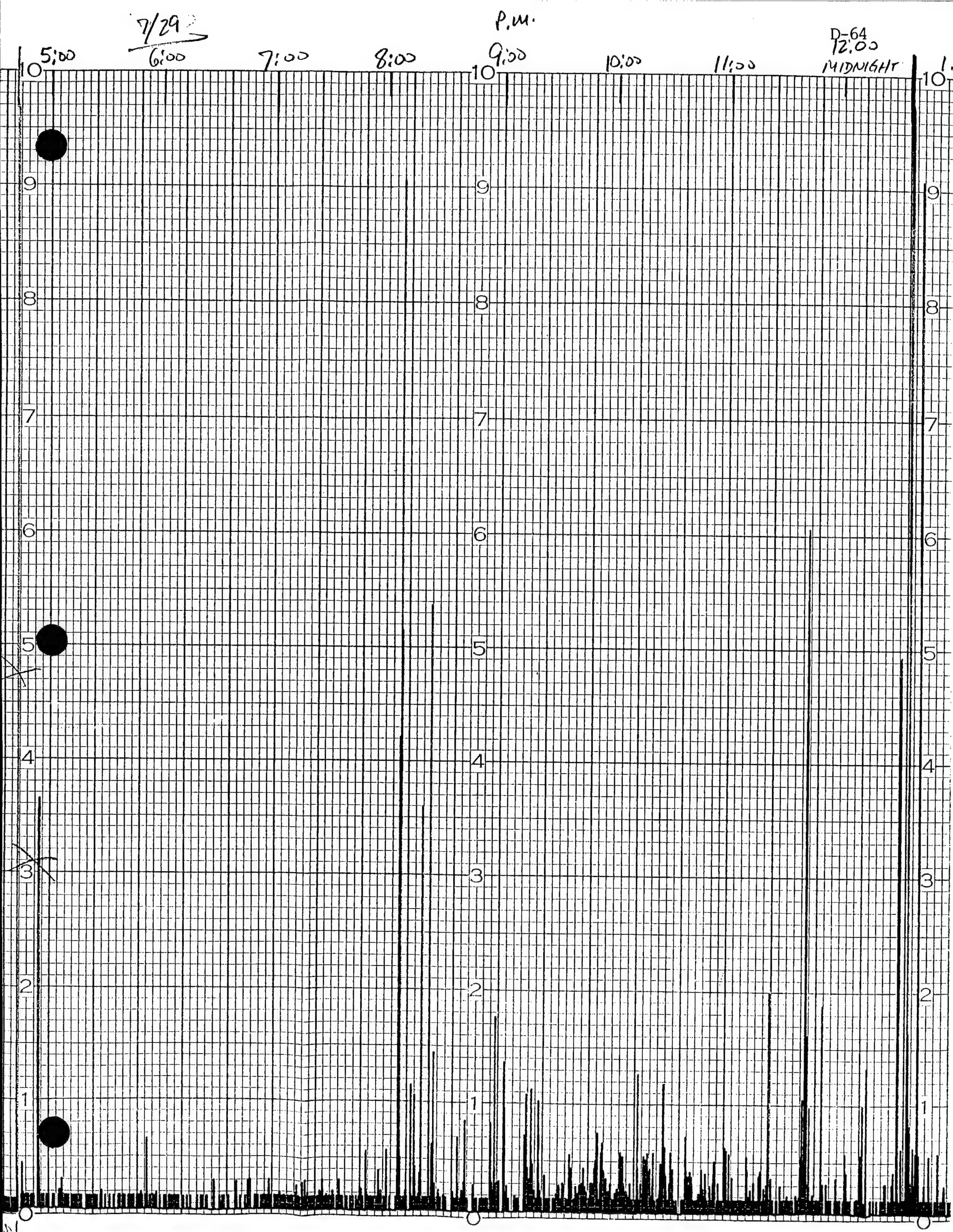
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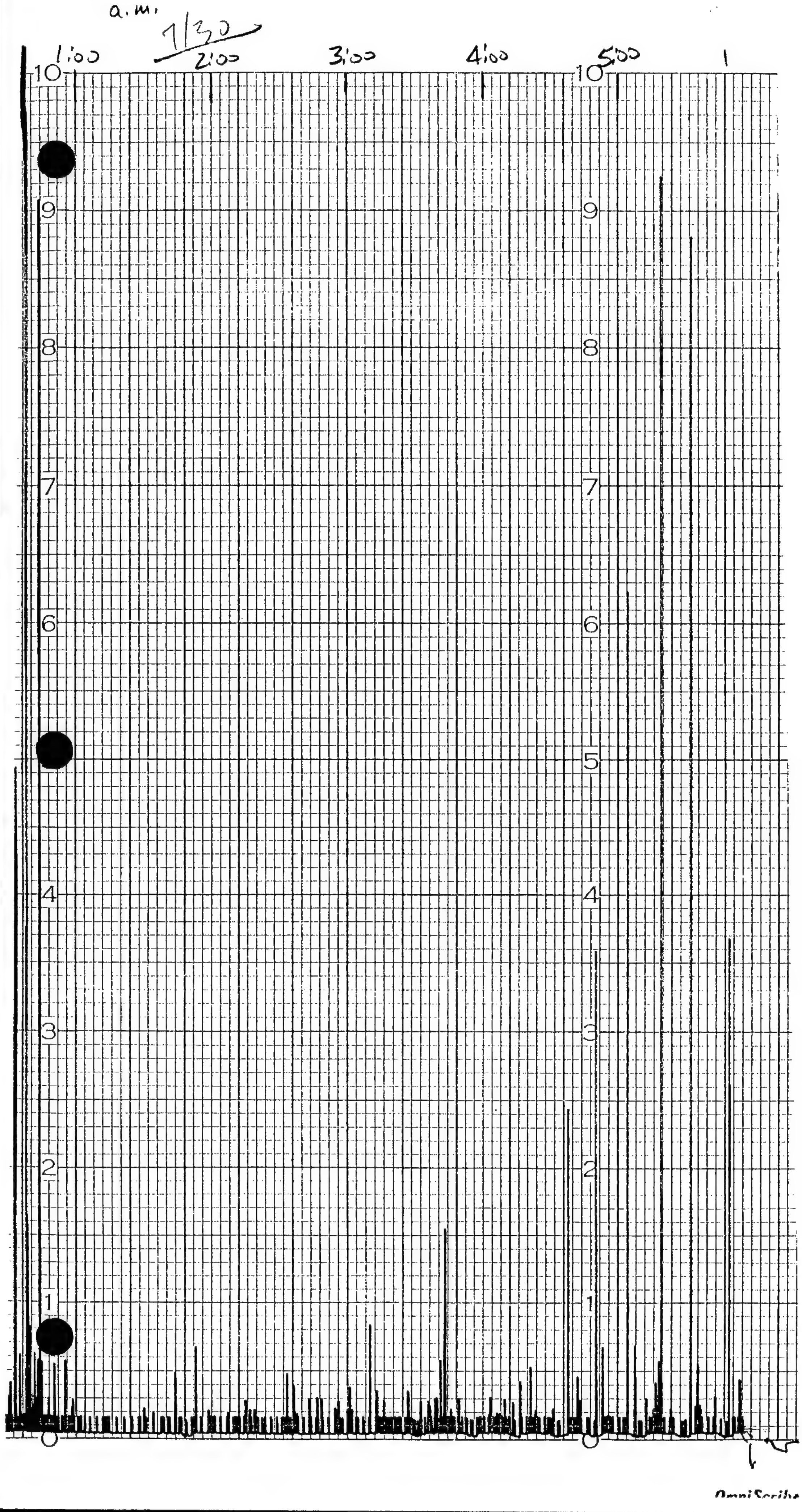

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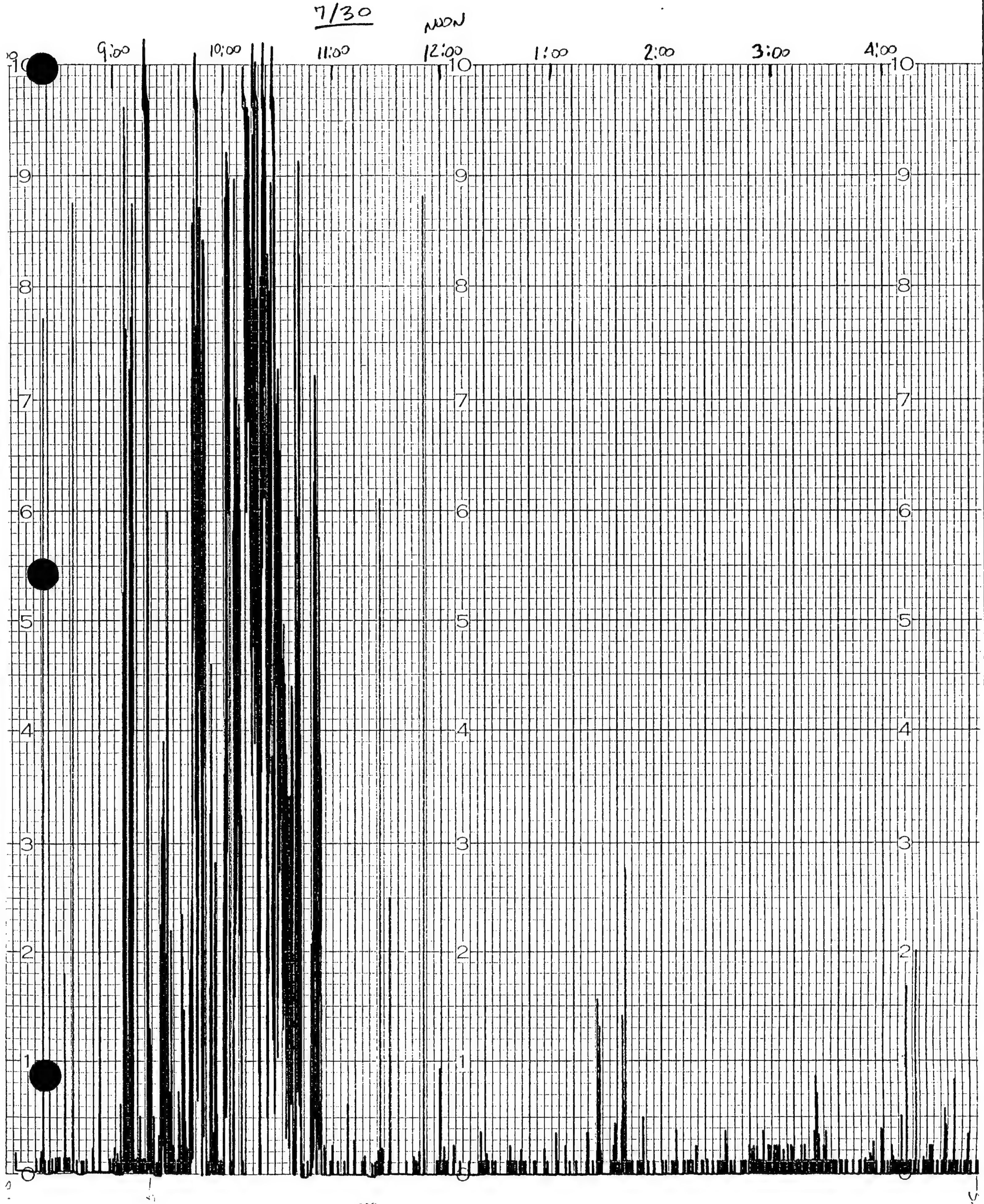
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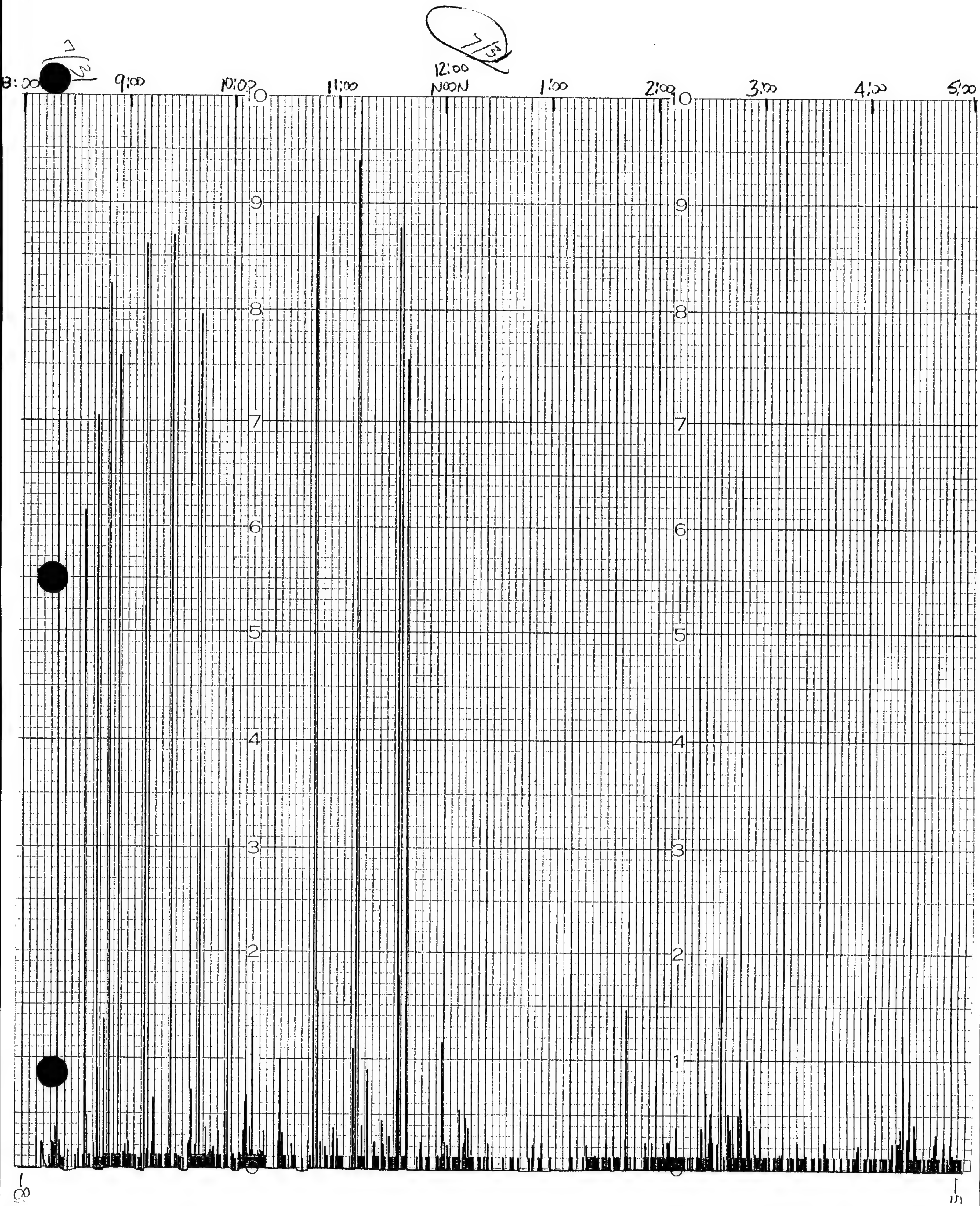
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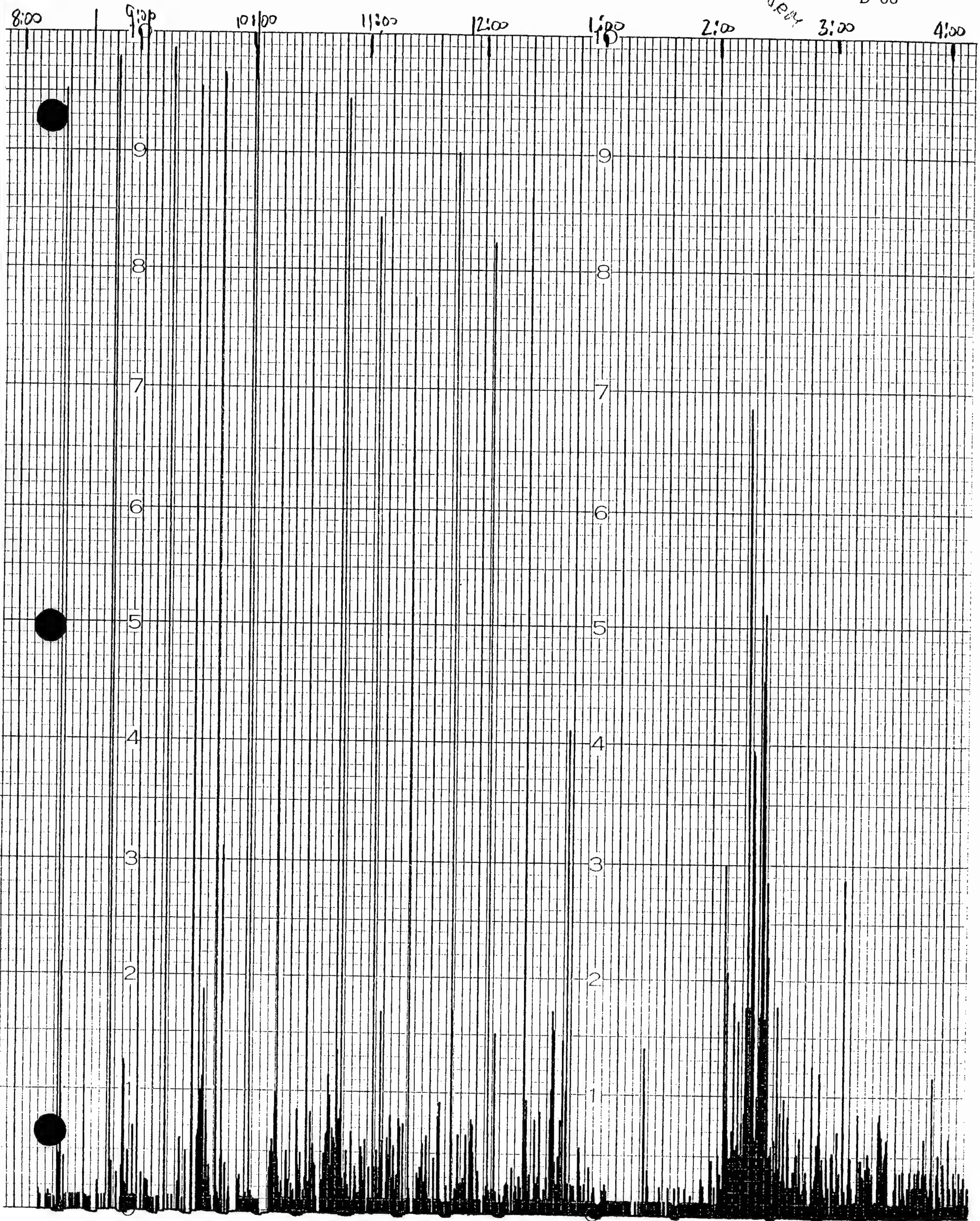
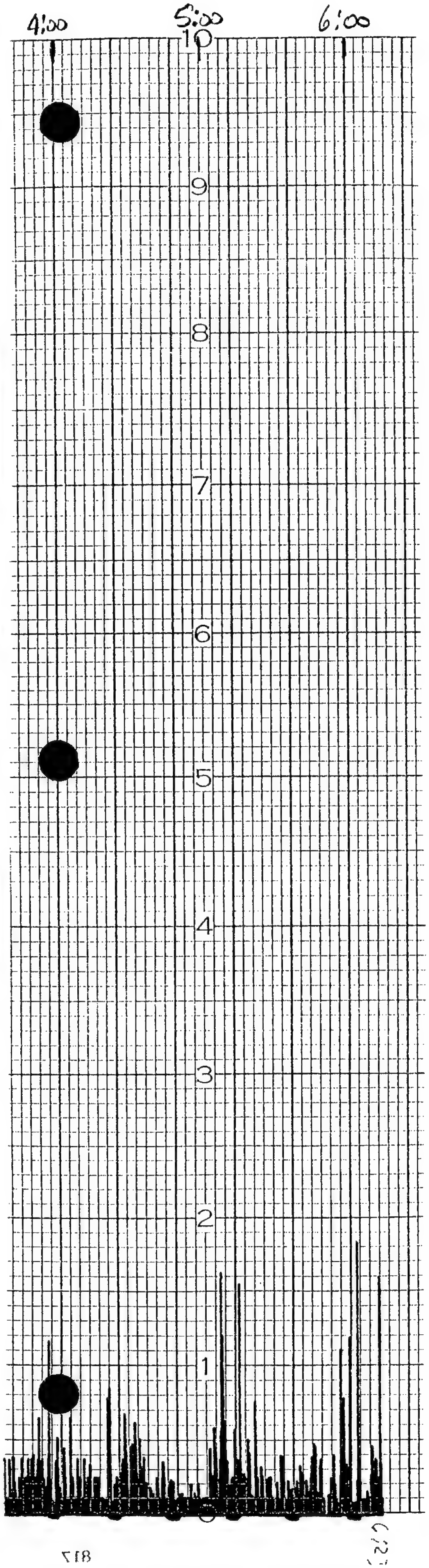
D-68



8-1-96

8-1-96



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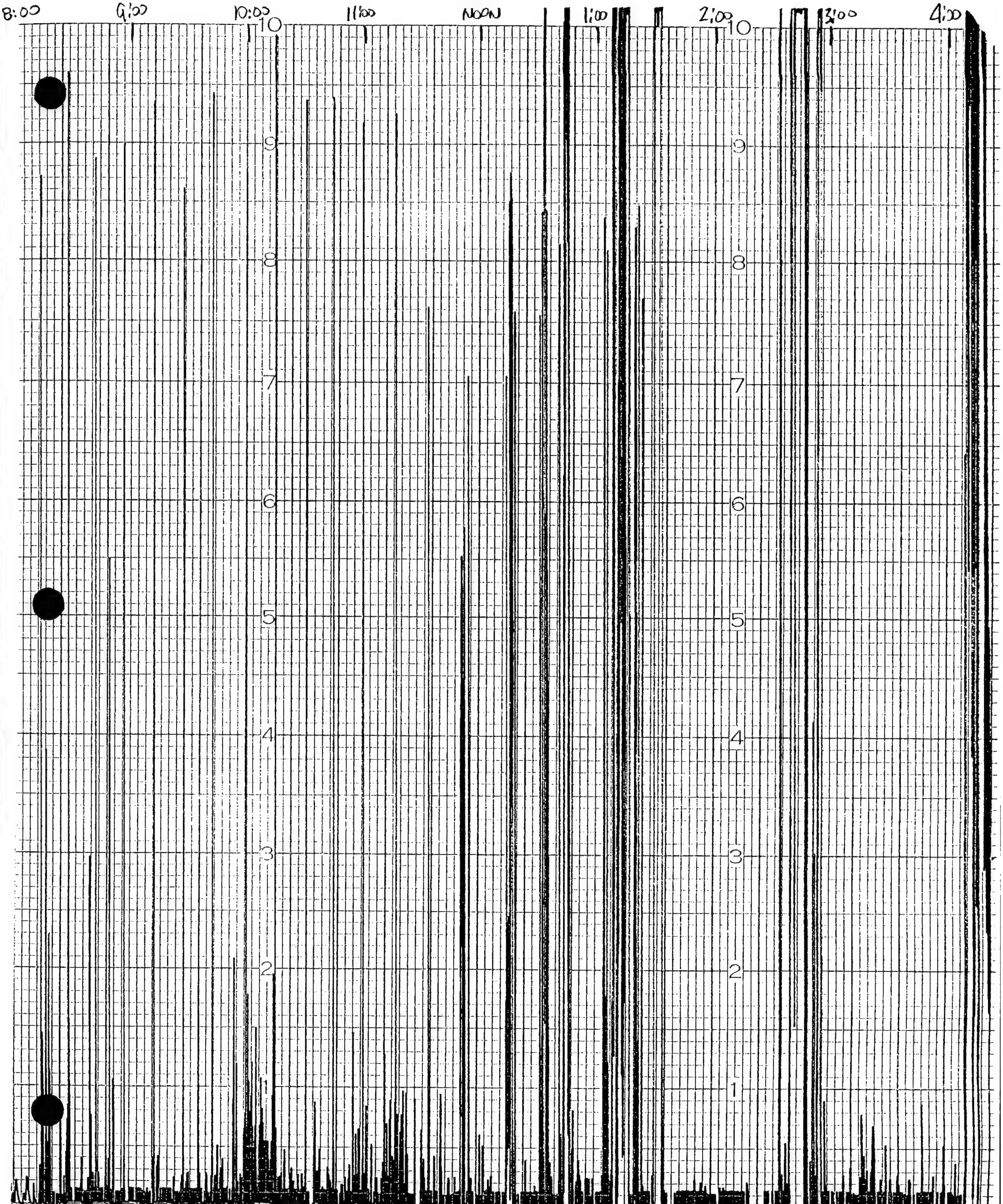

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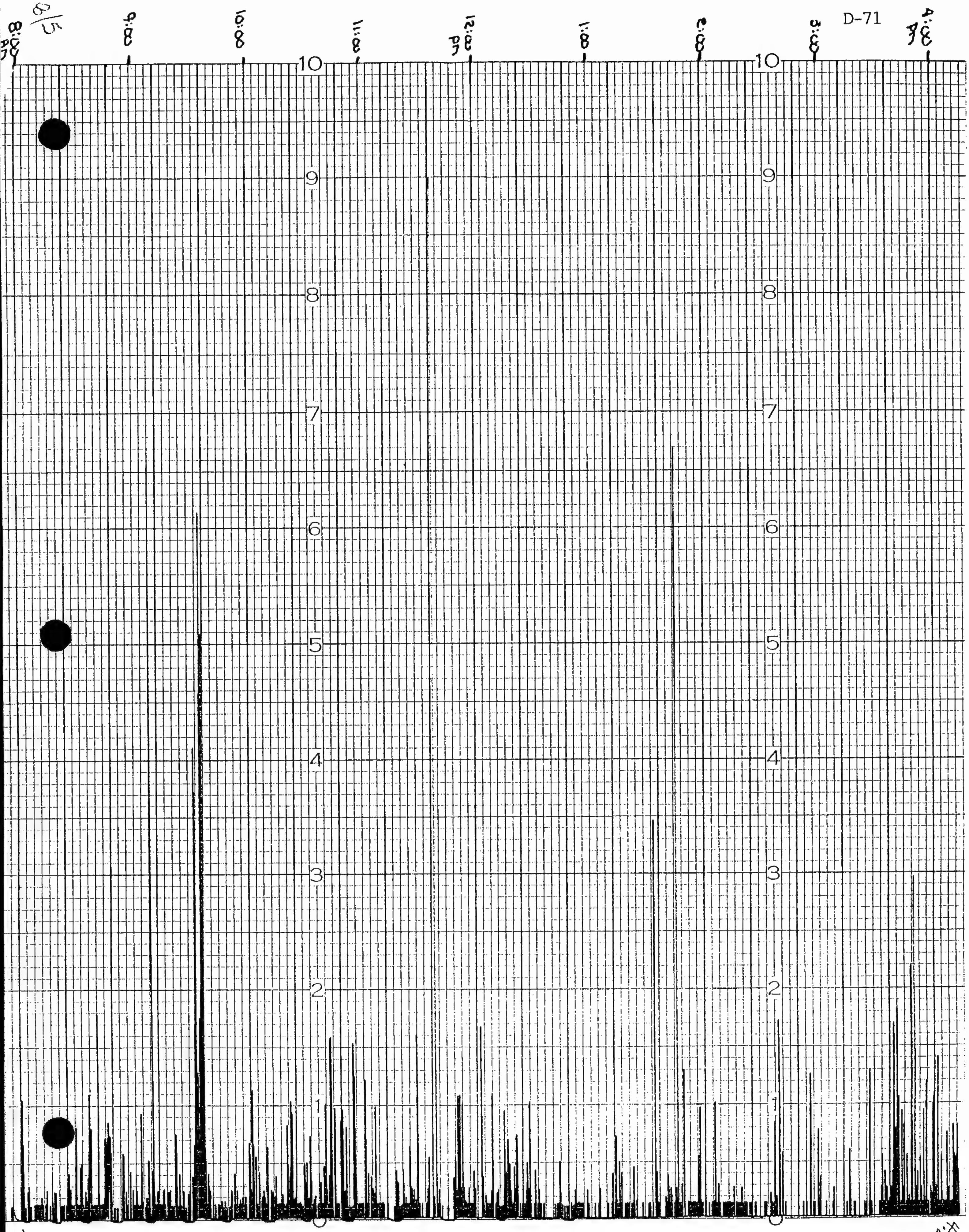
D-71



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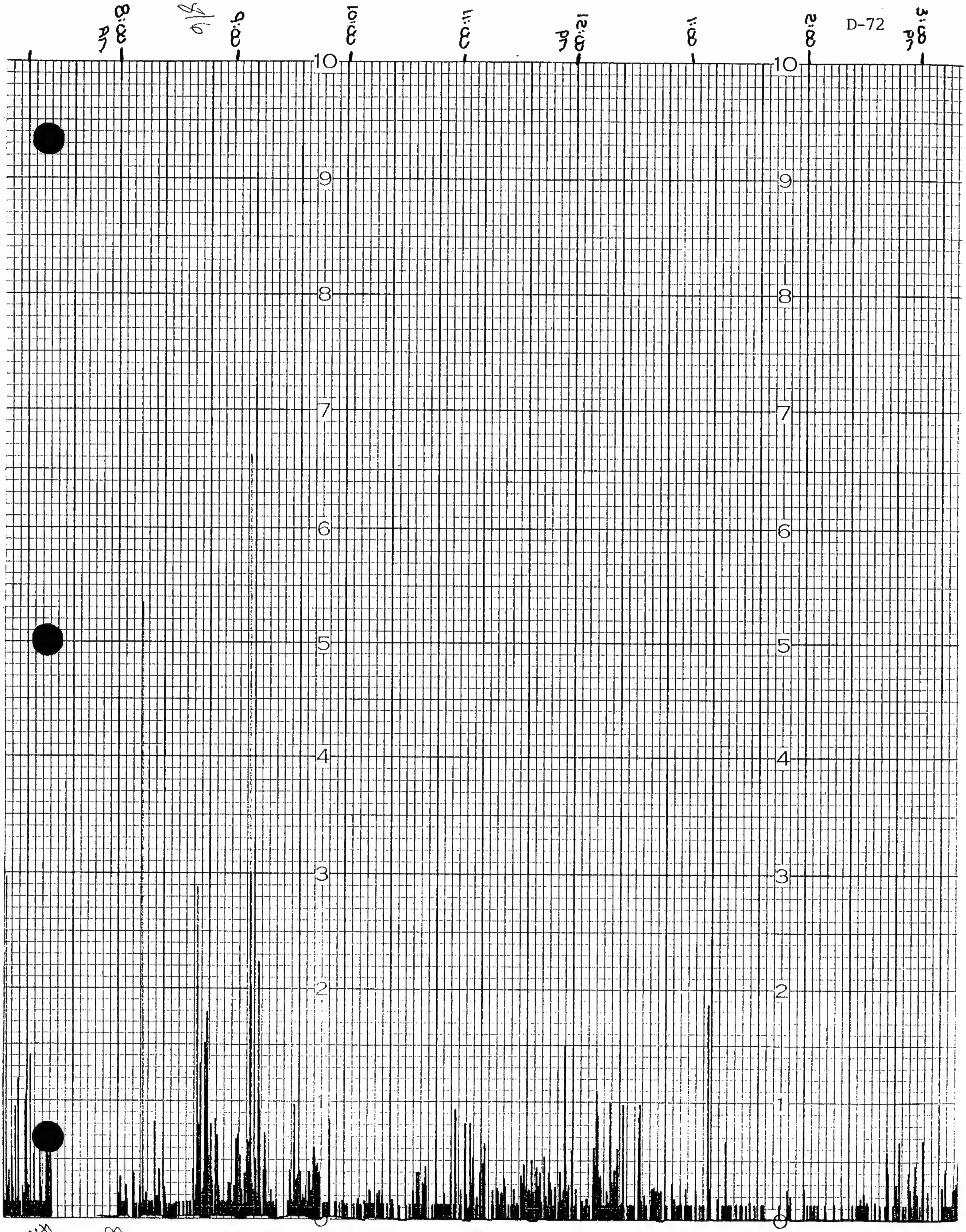

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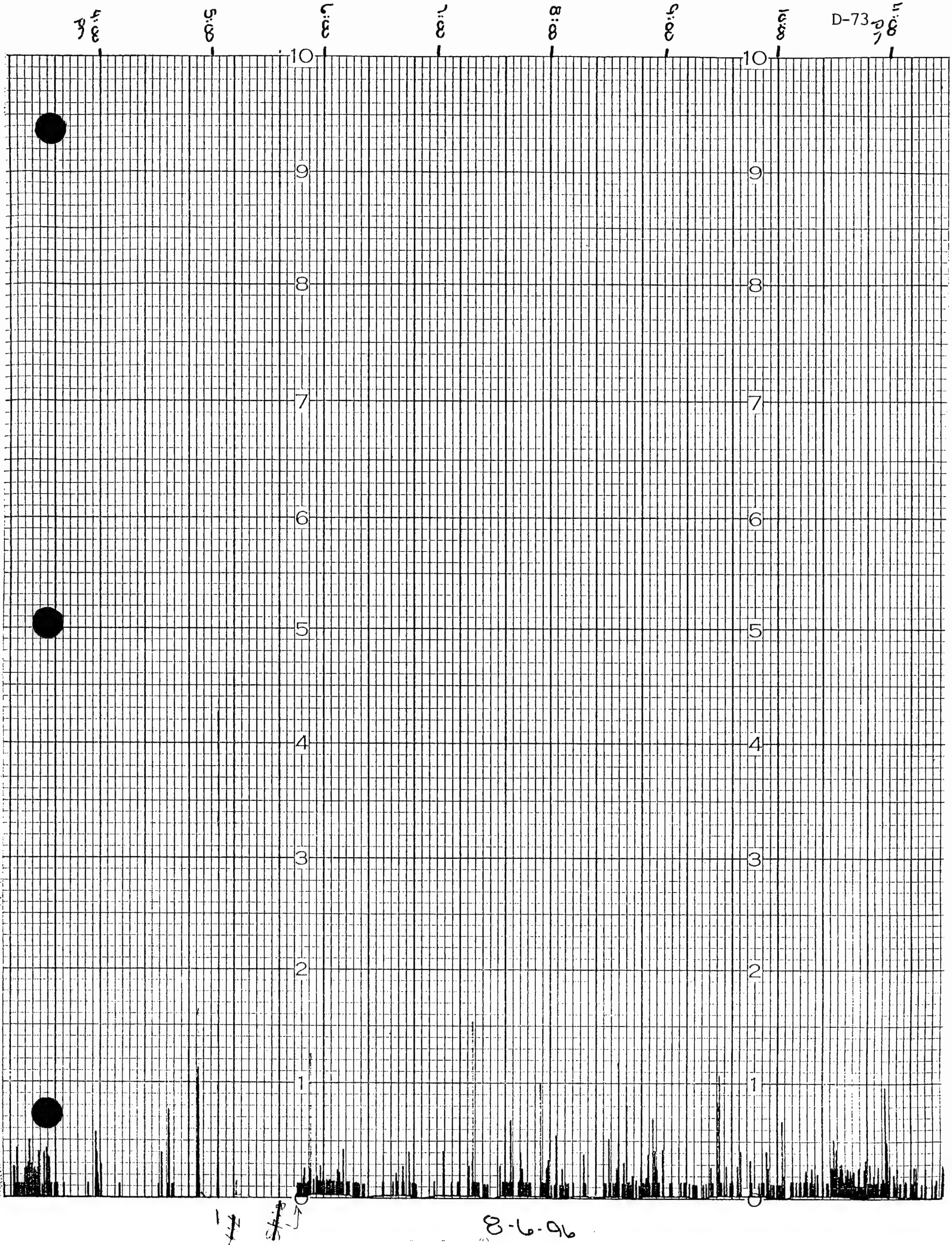
D-73



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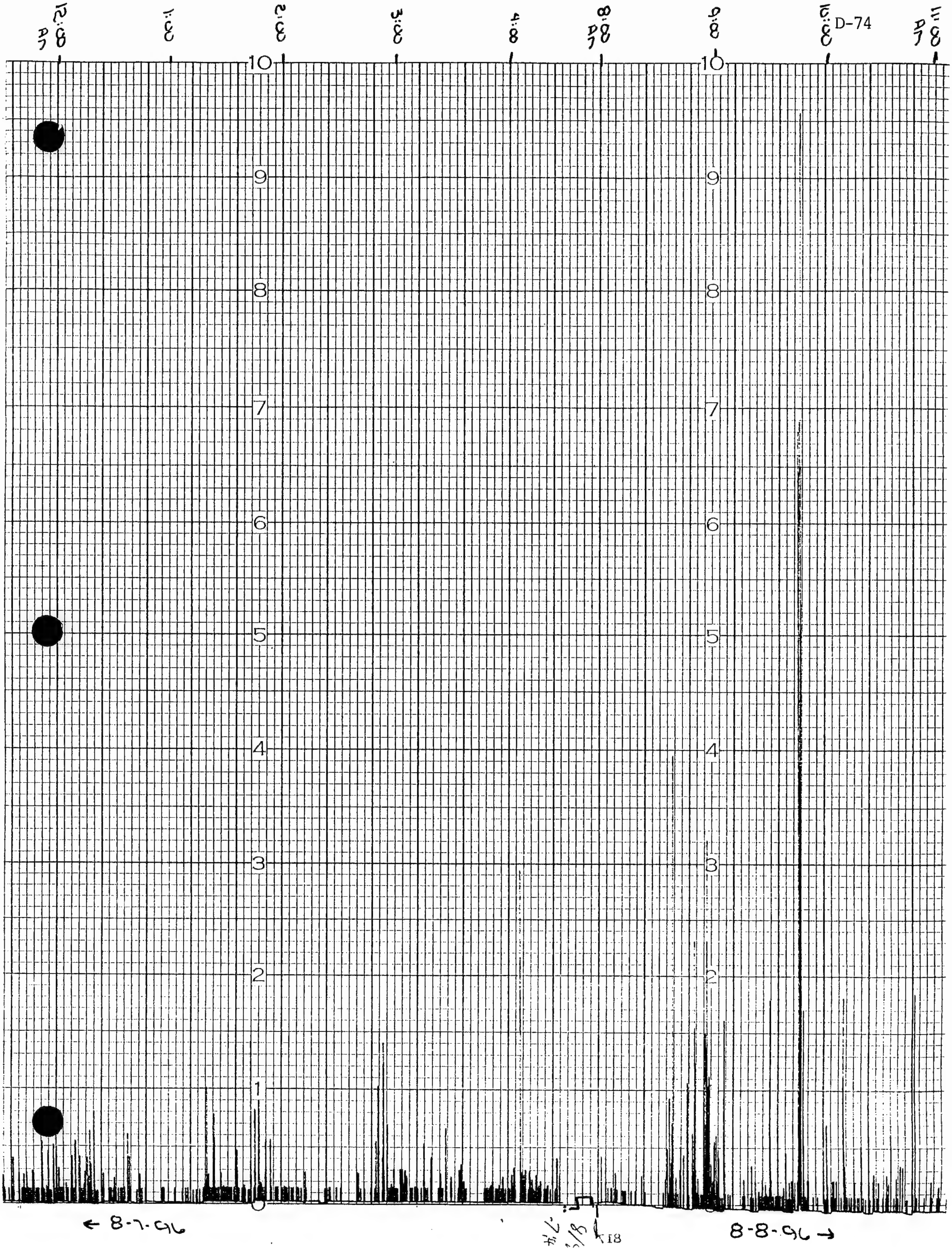
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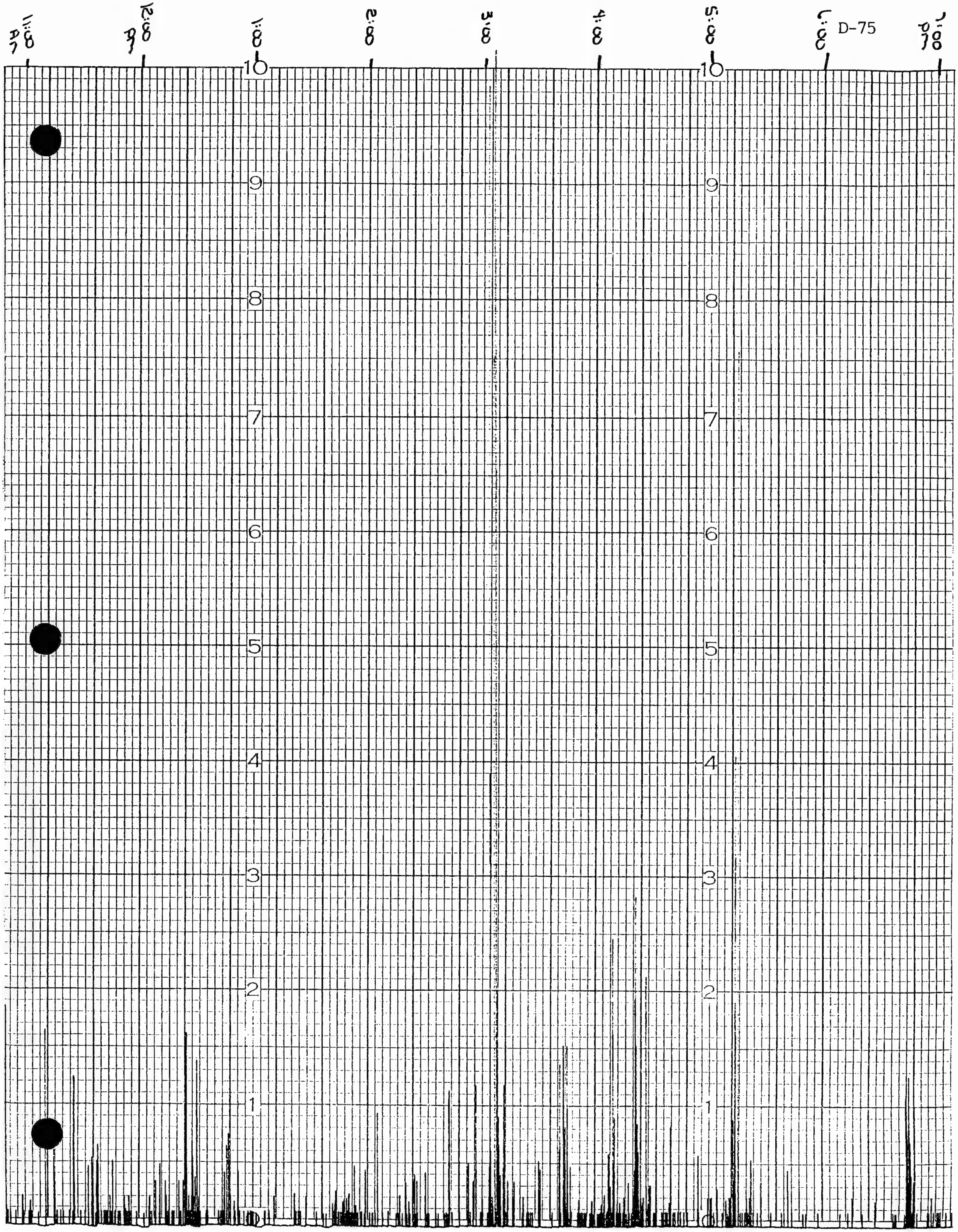

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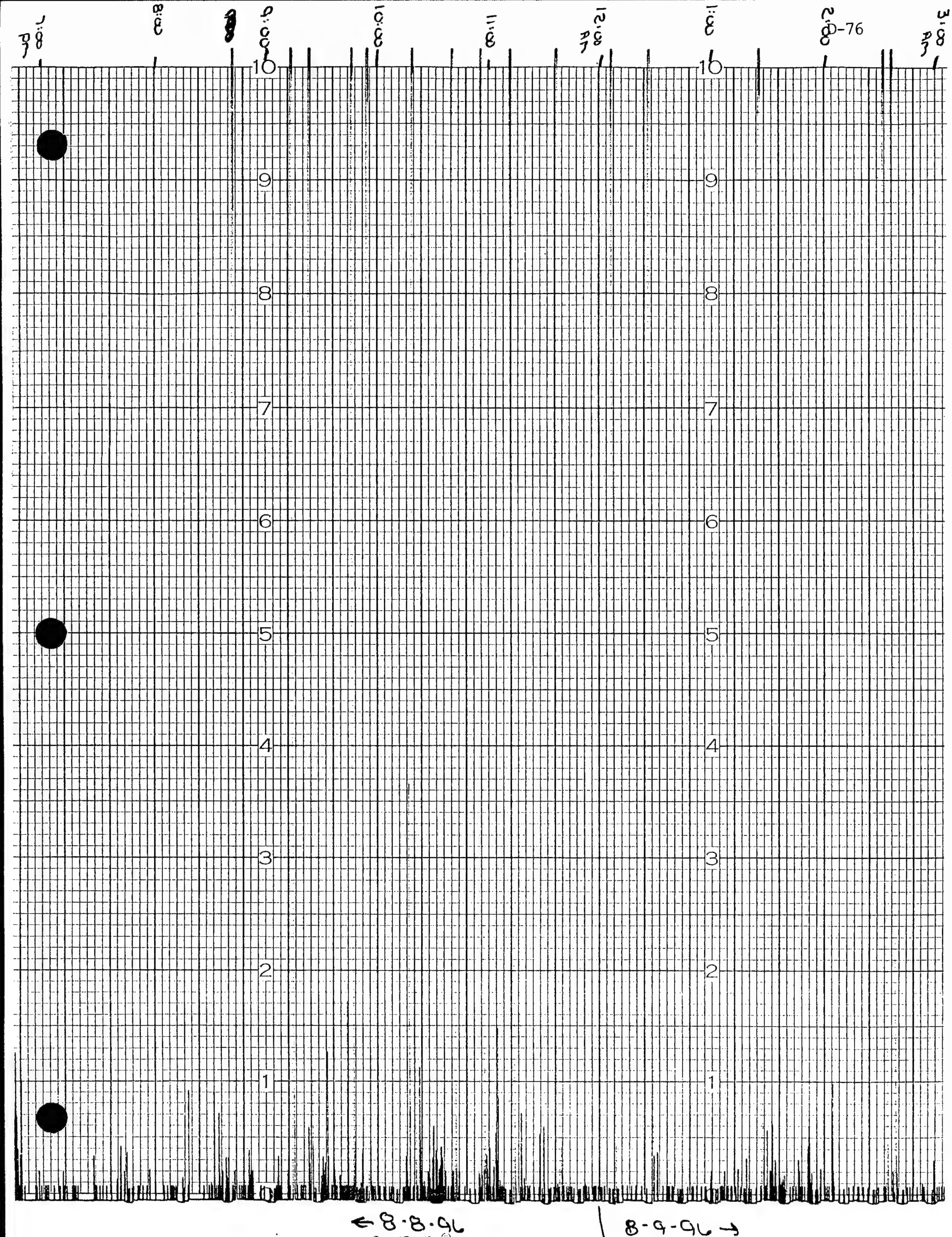
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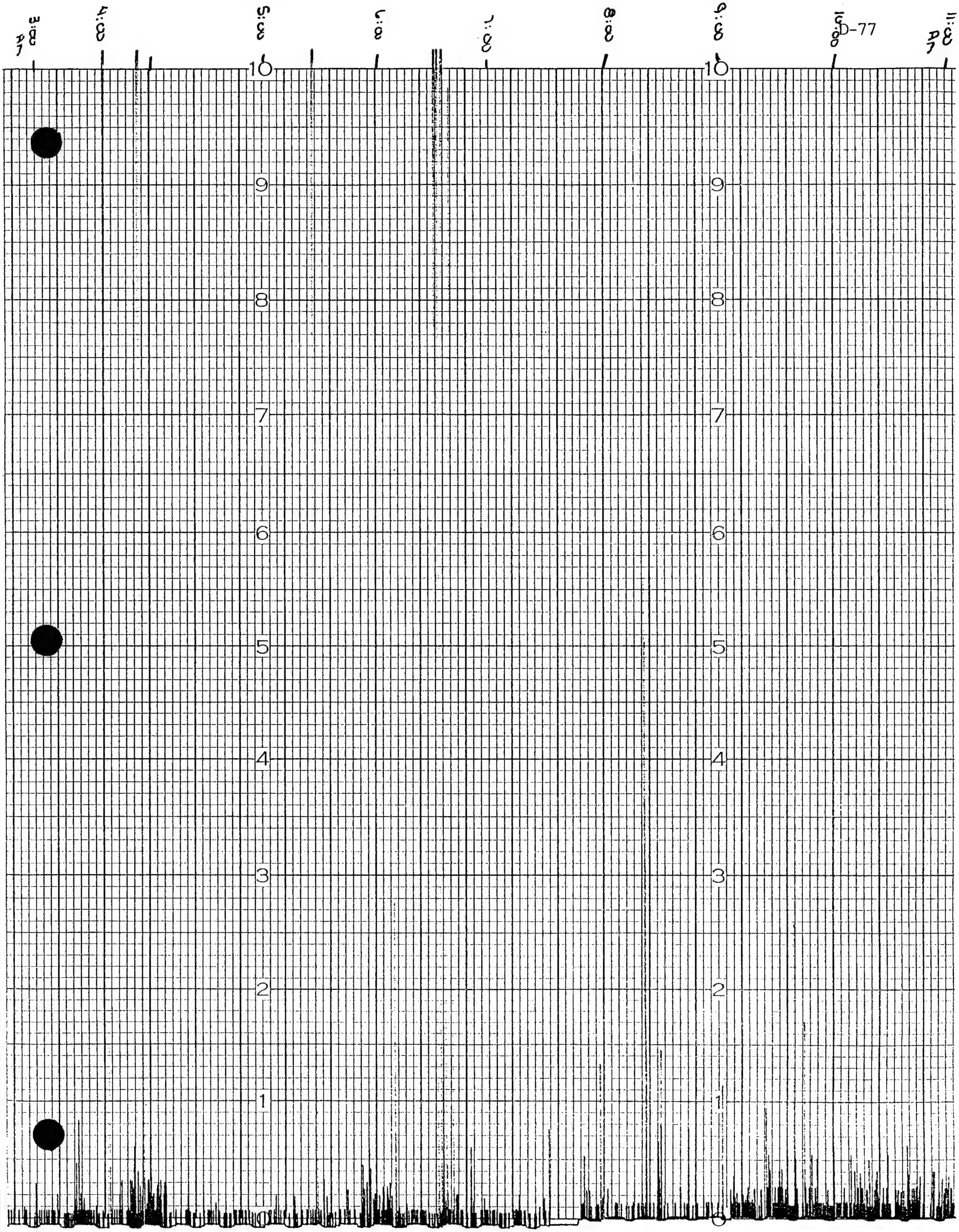
8-9-96 →



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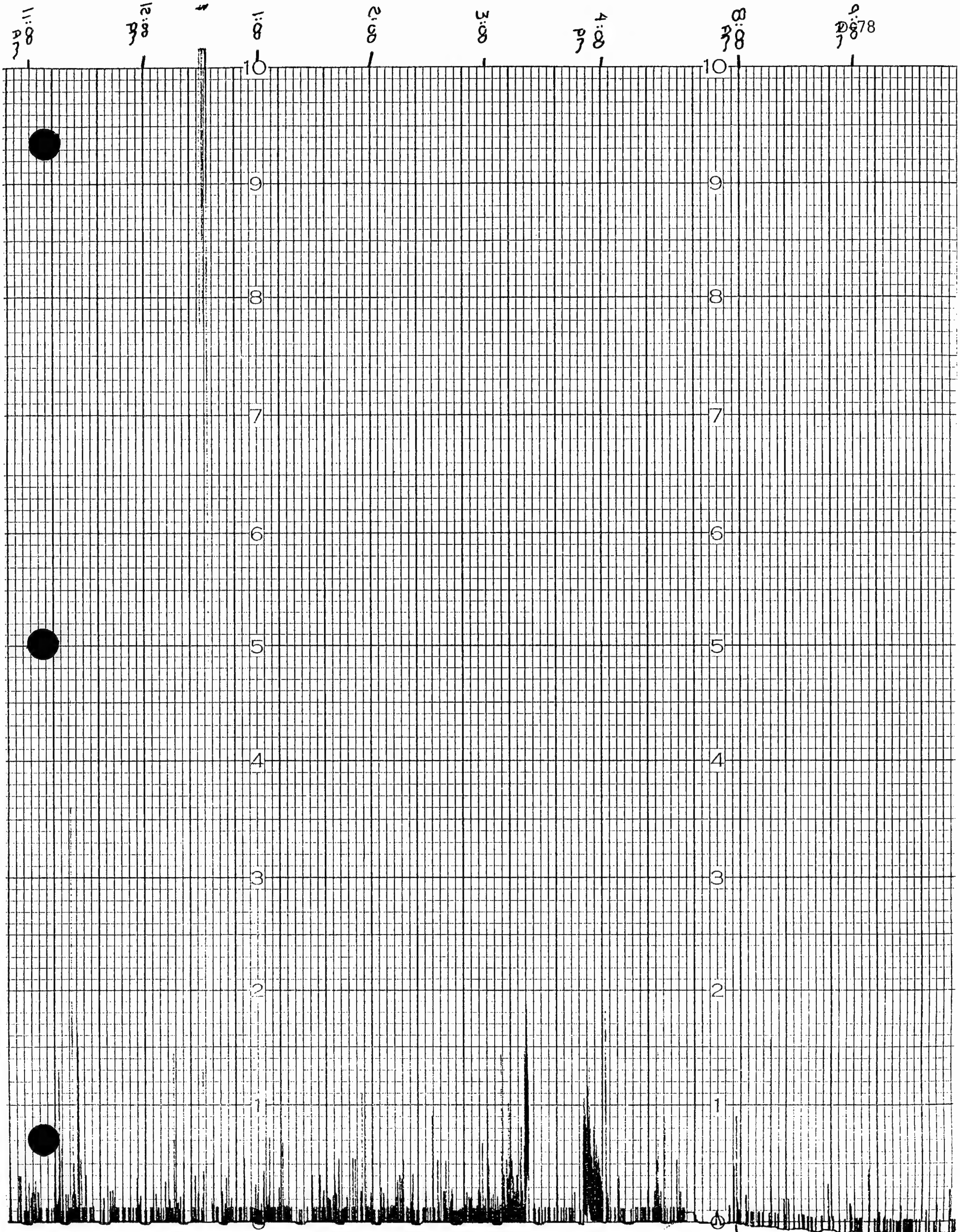

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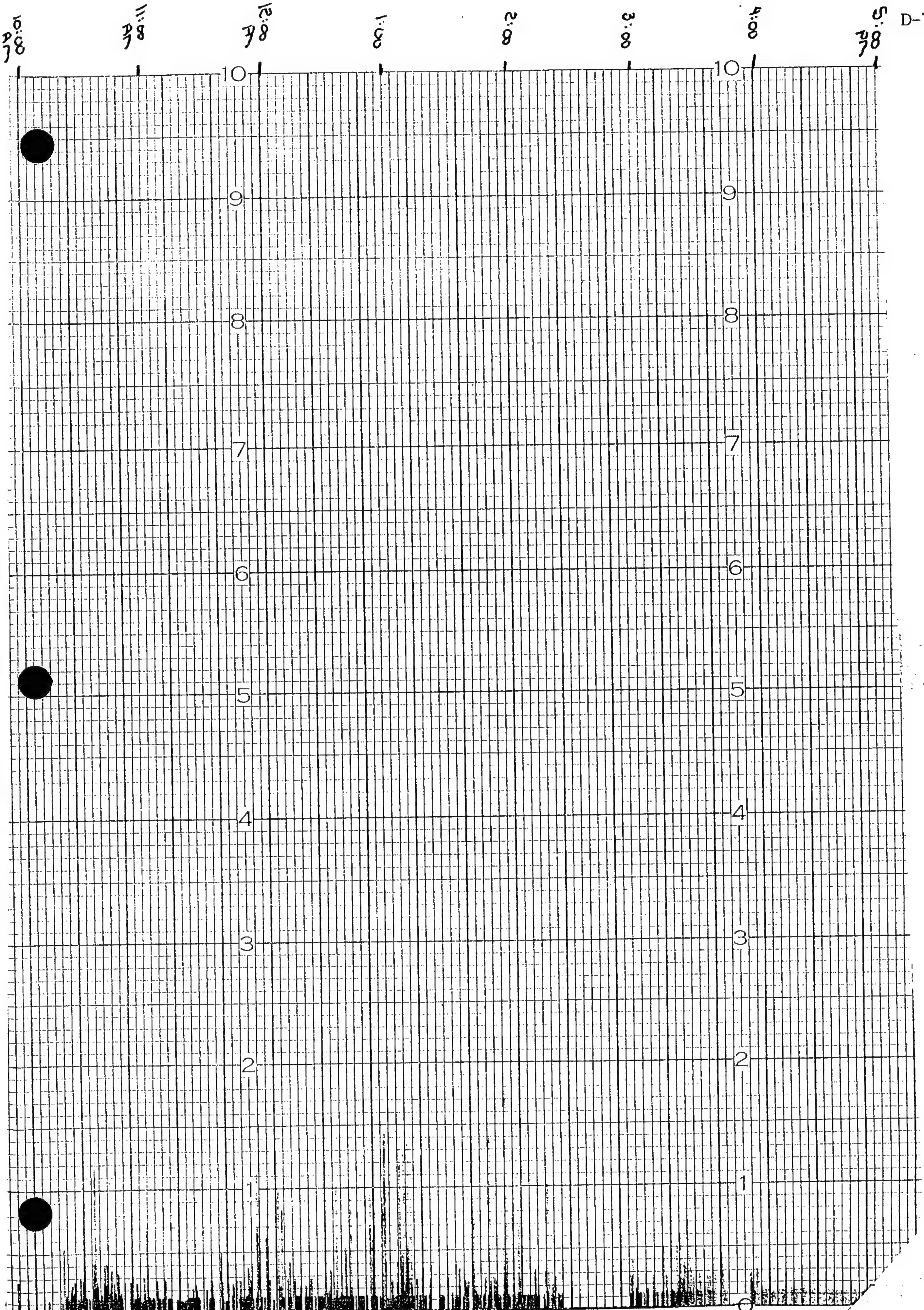
8-10-96 →

D-79



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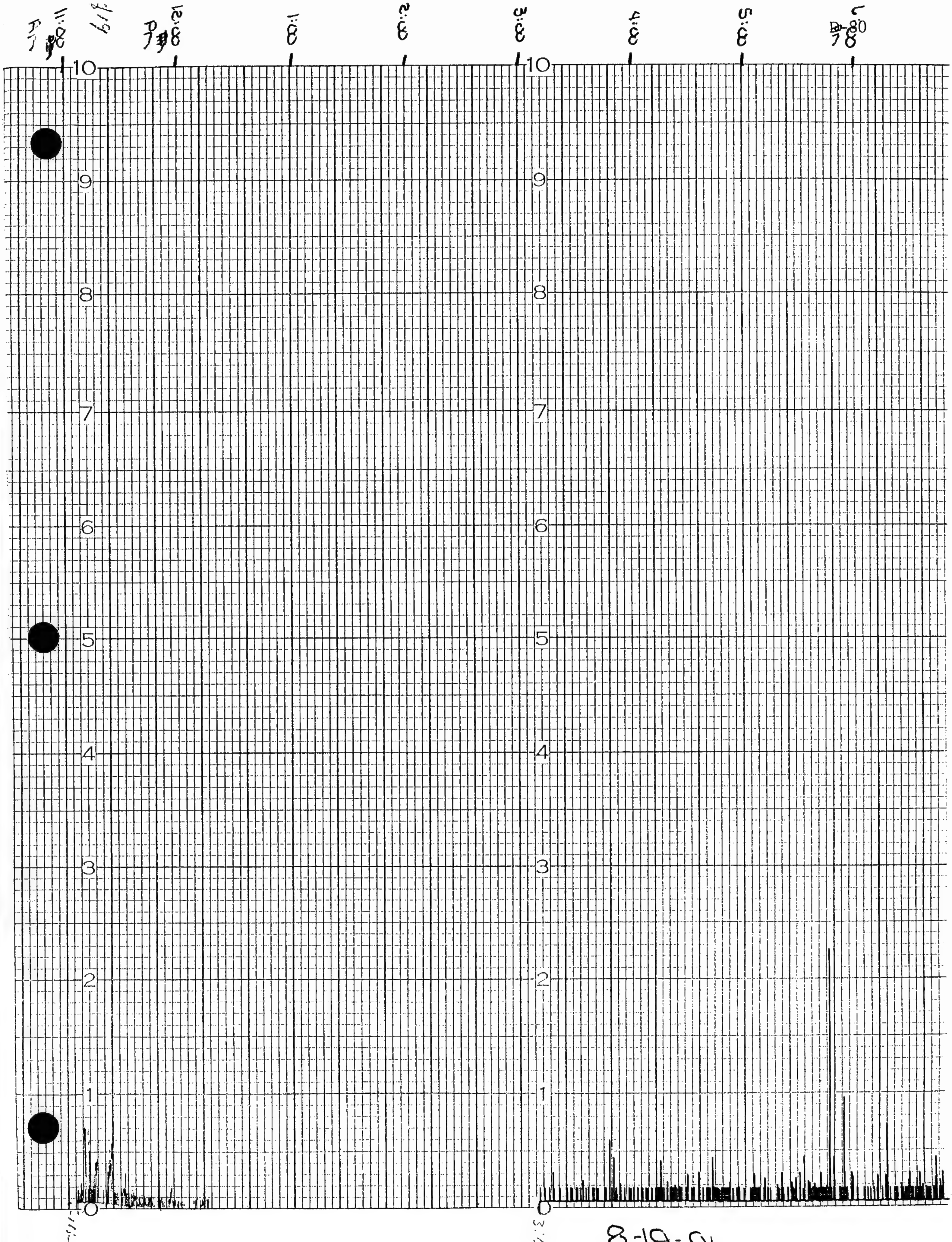

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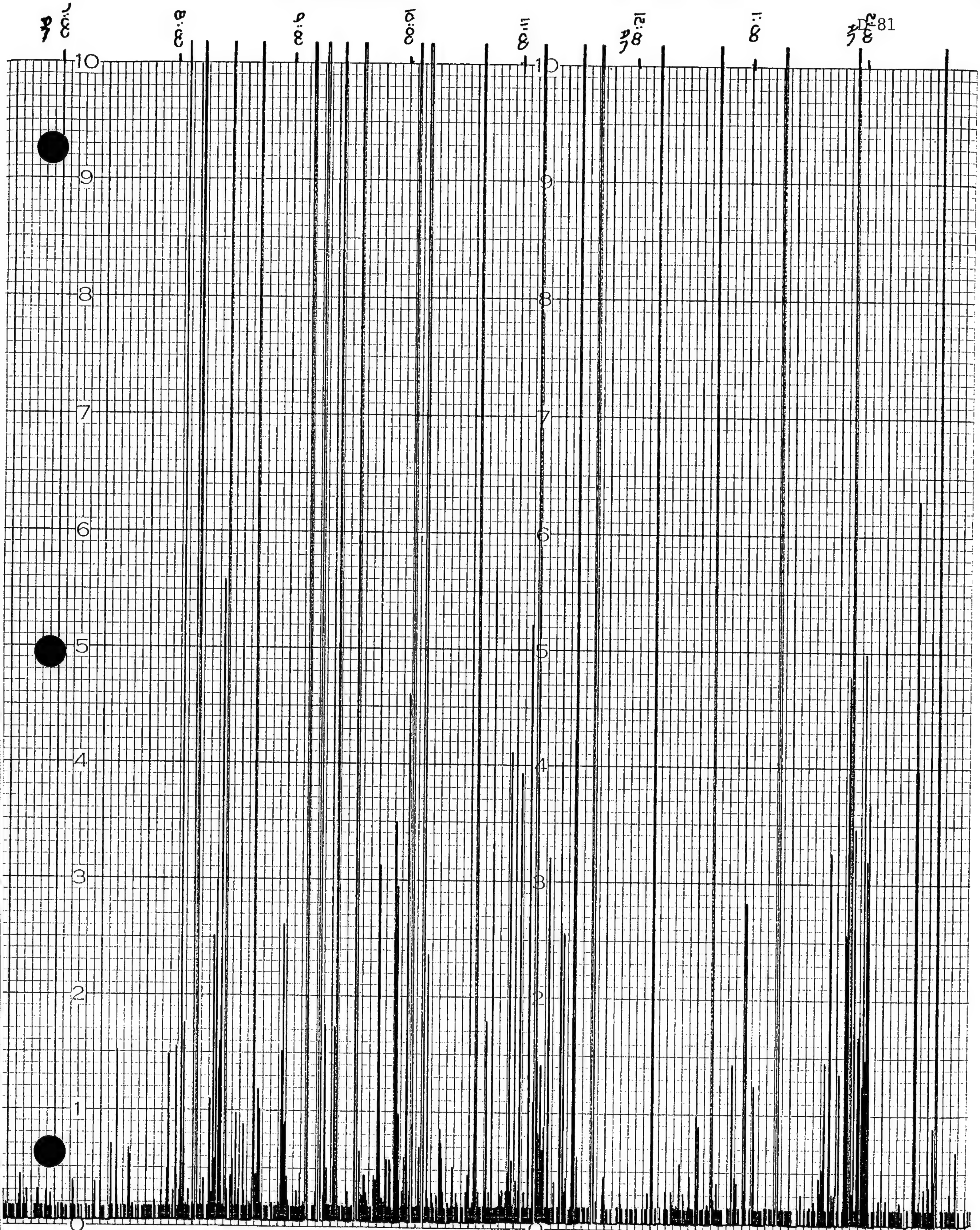
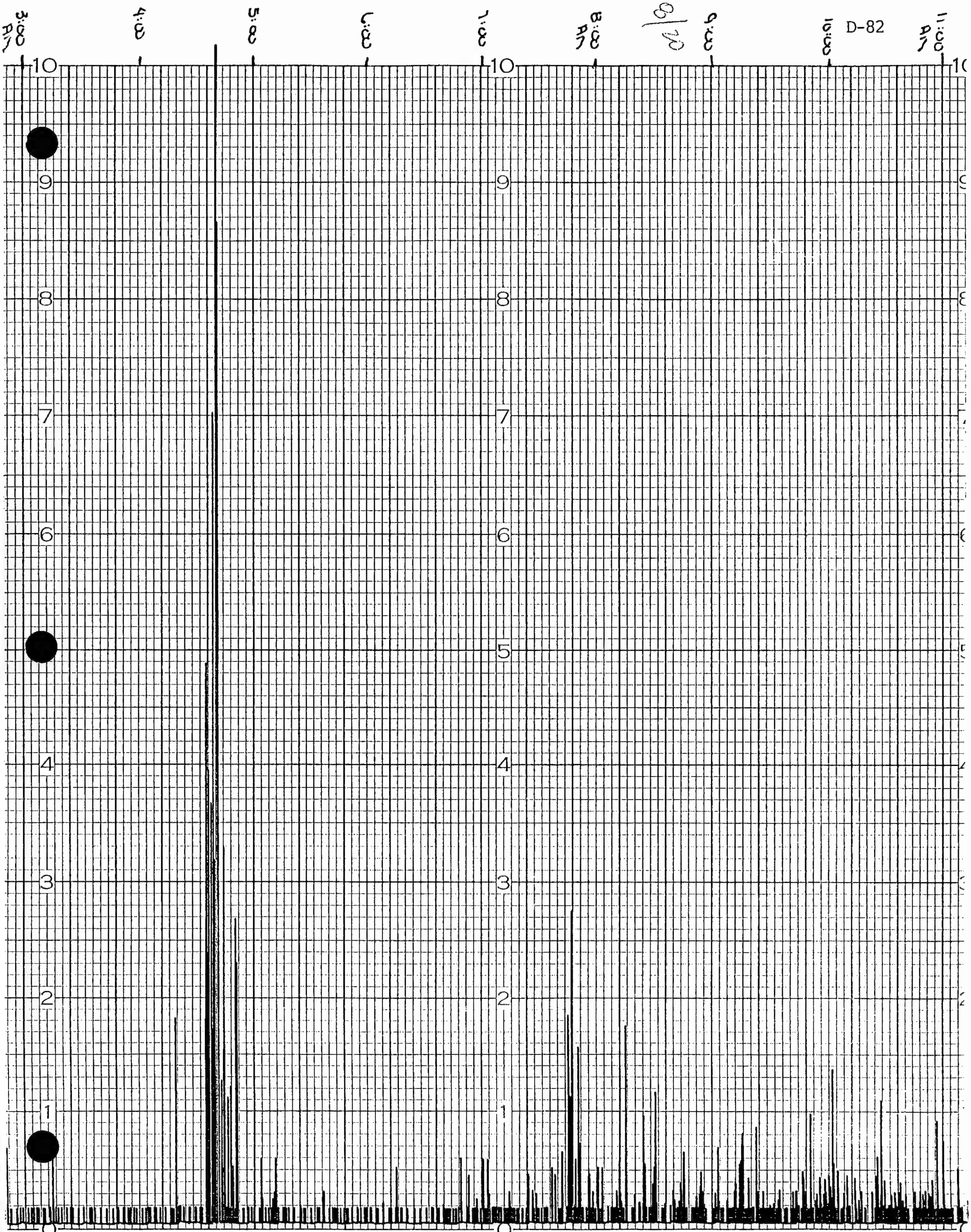
D-81



8-19-96

8/20/96 →



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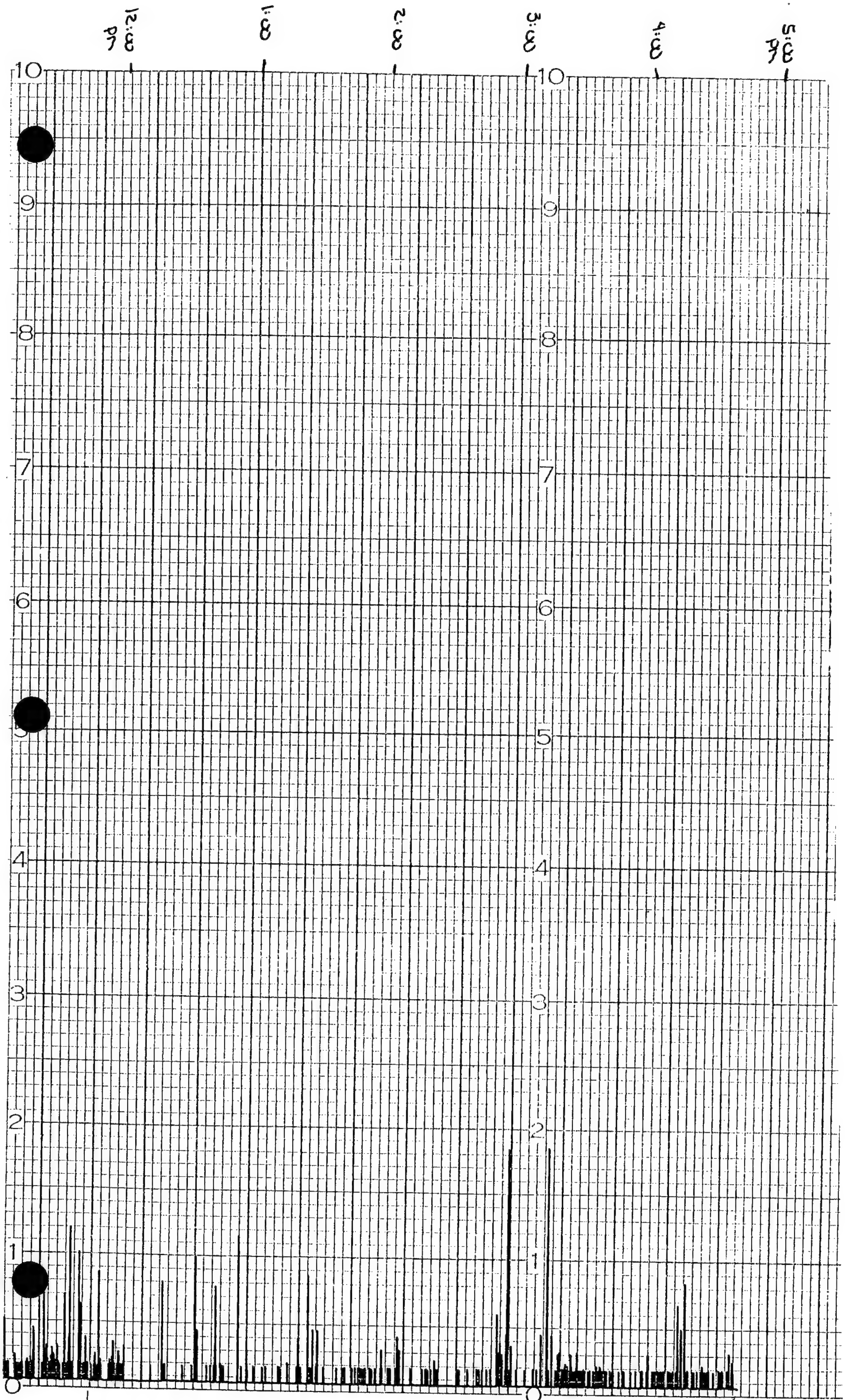
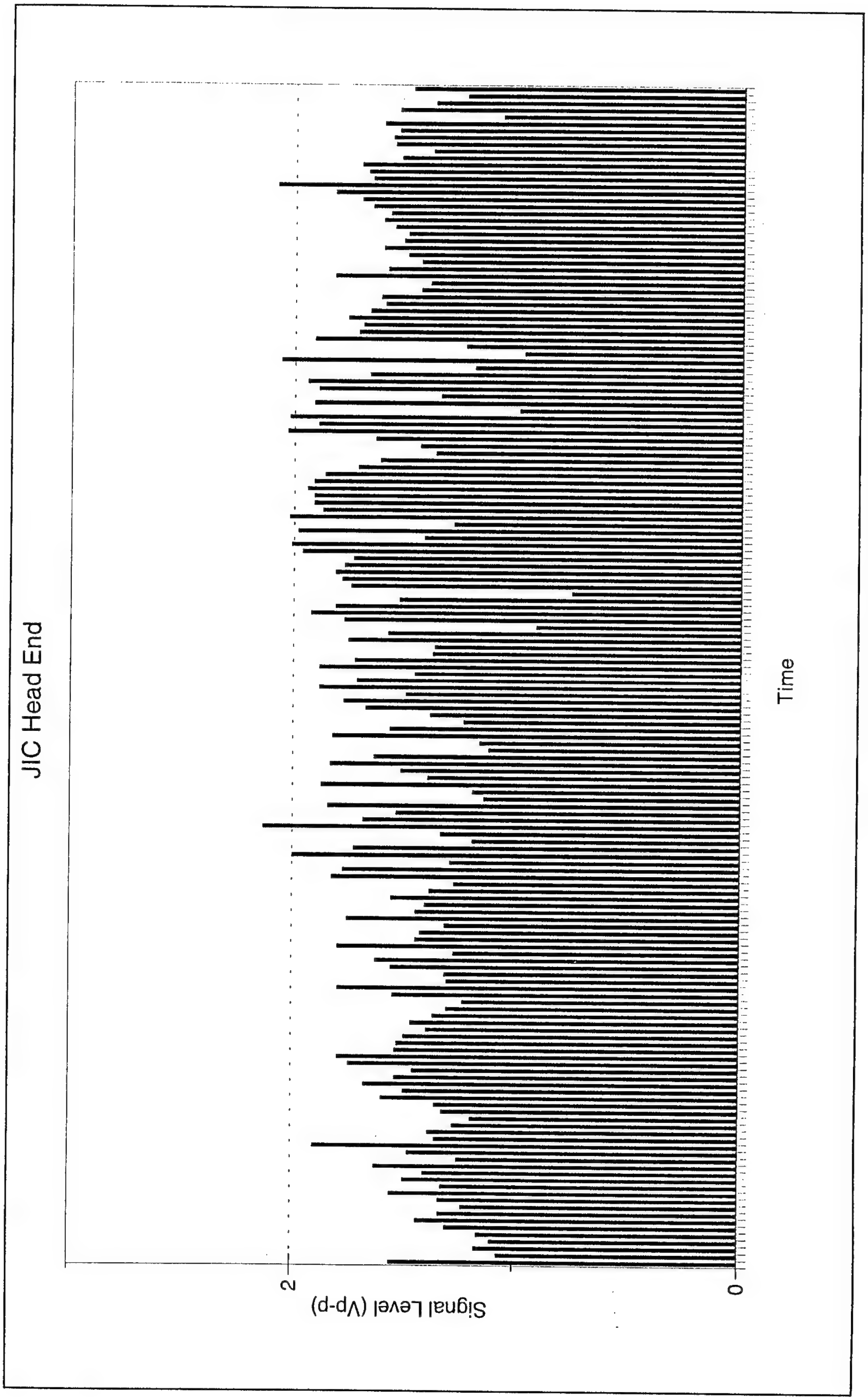


8-20-96

Return Path Signal Level Measurements


JIC Head End
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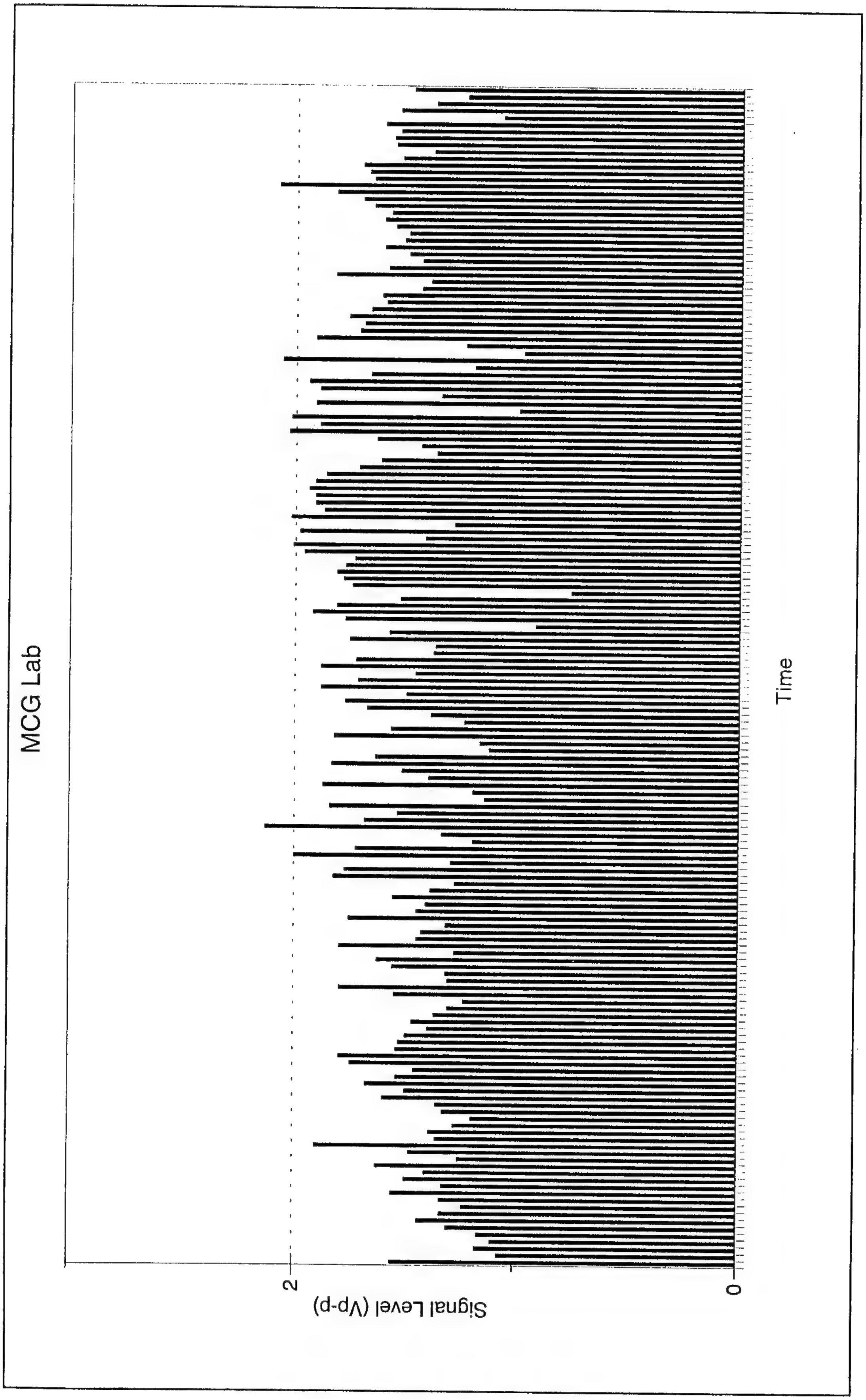
Time


MCG Lab
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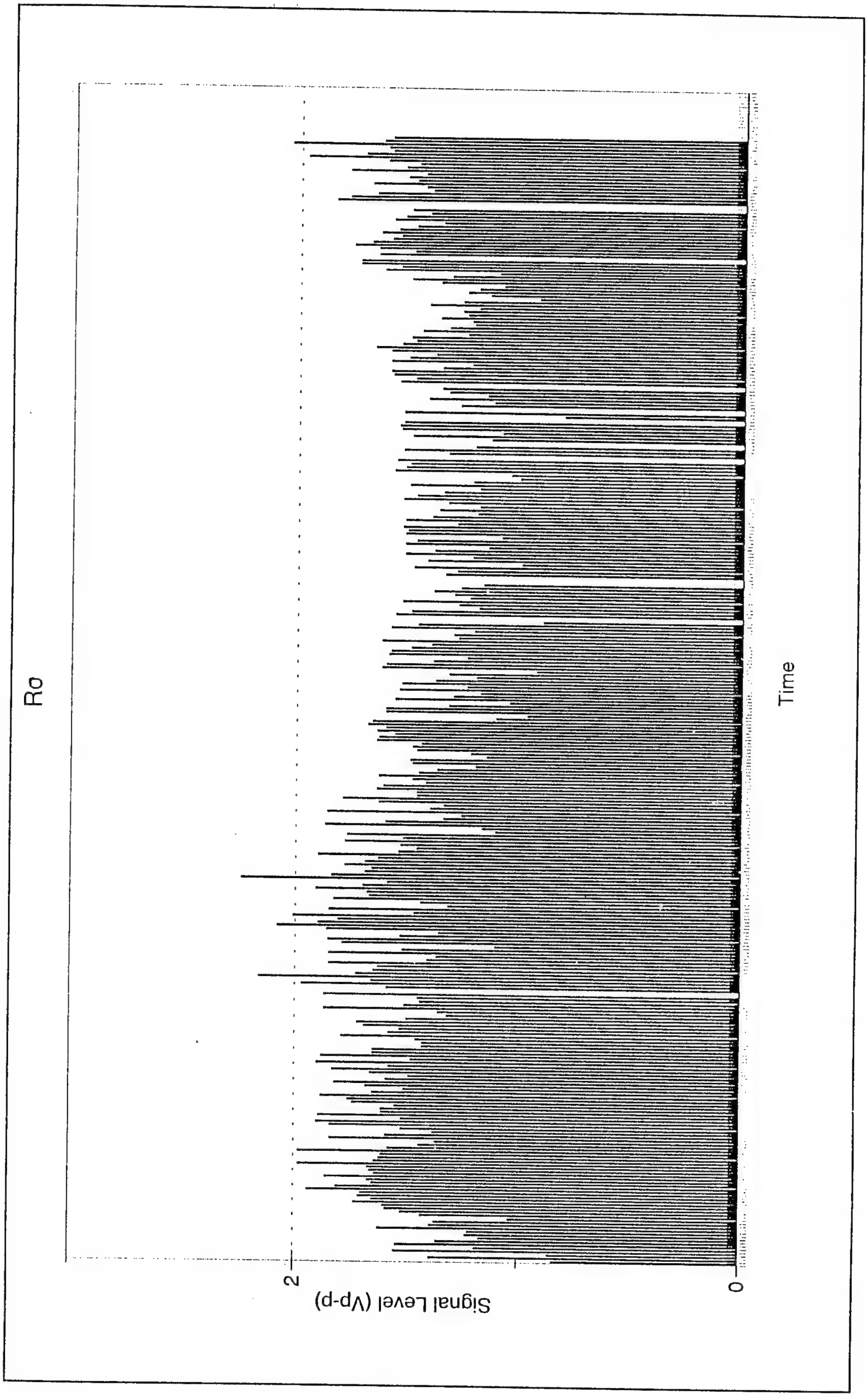

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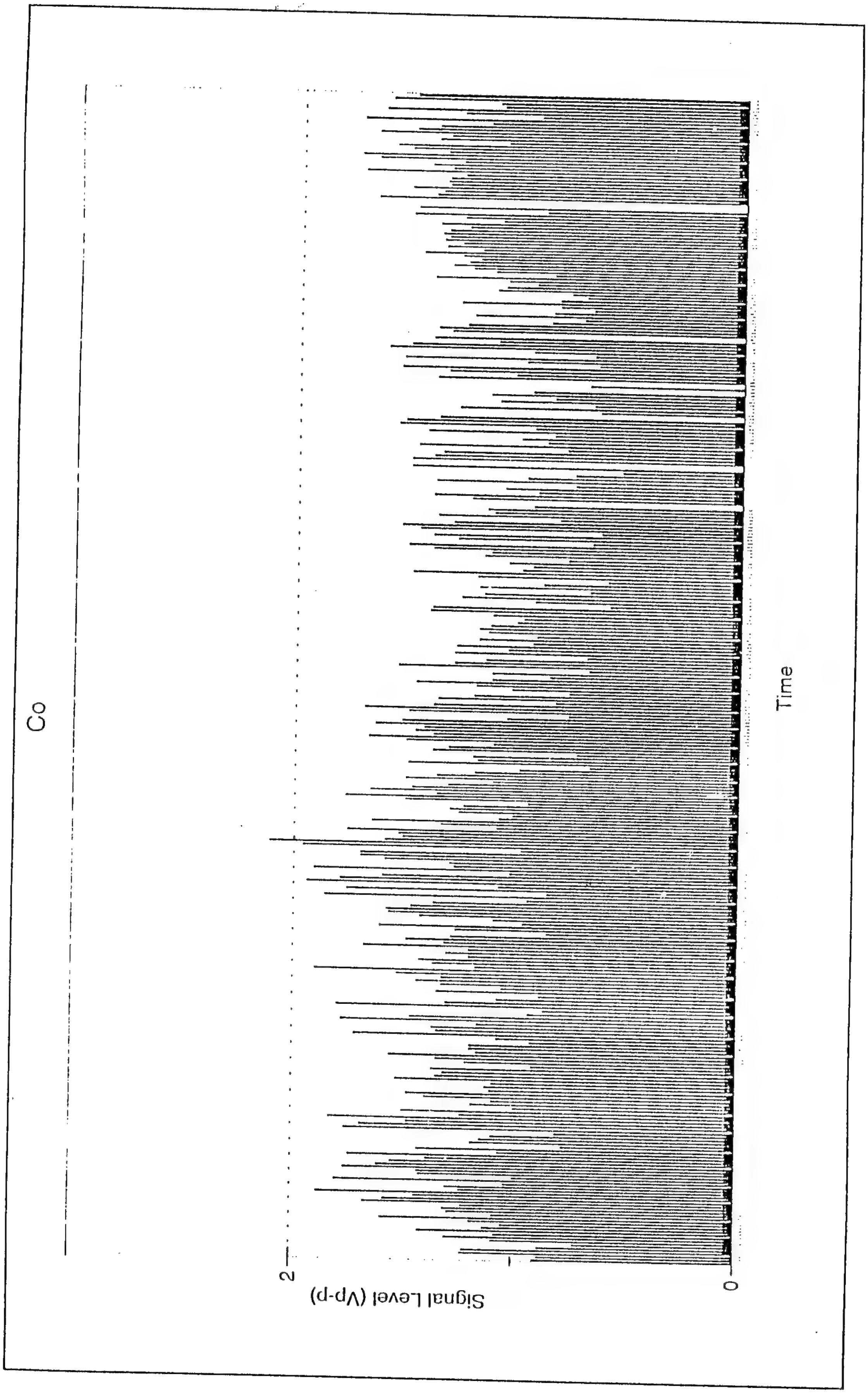
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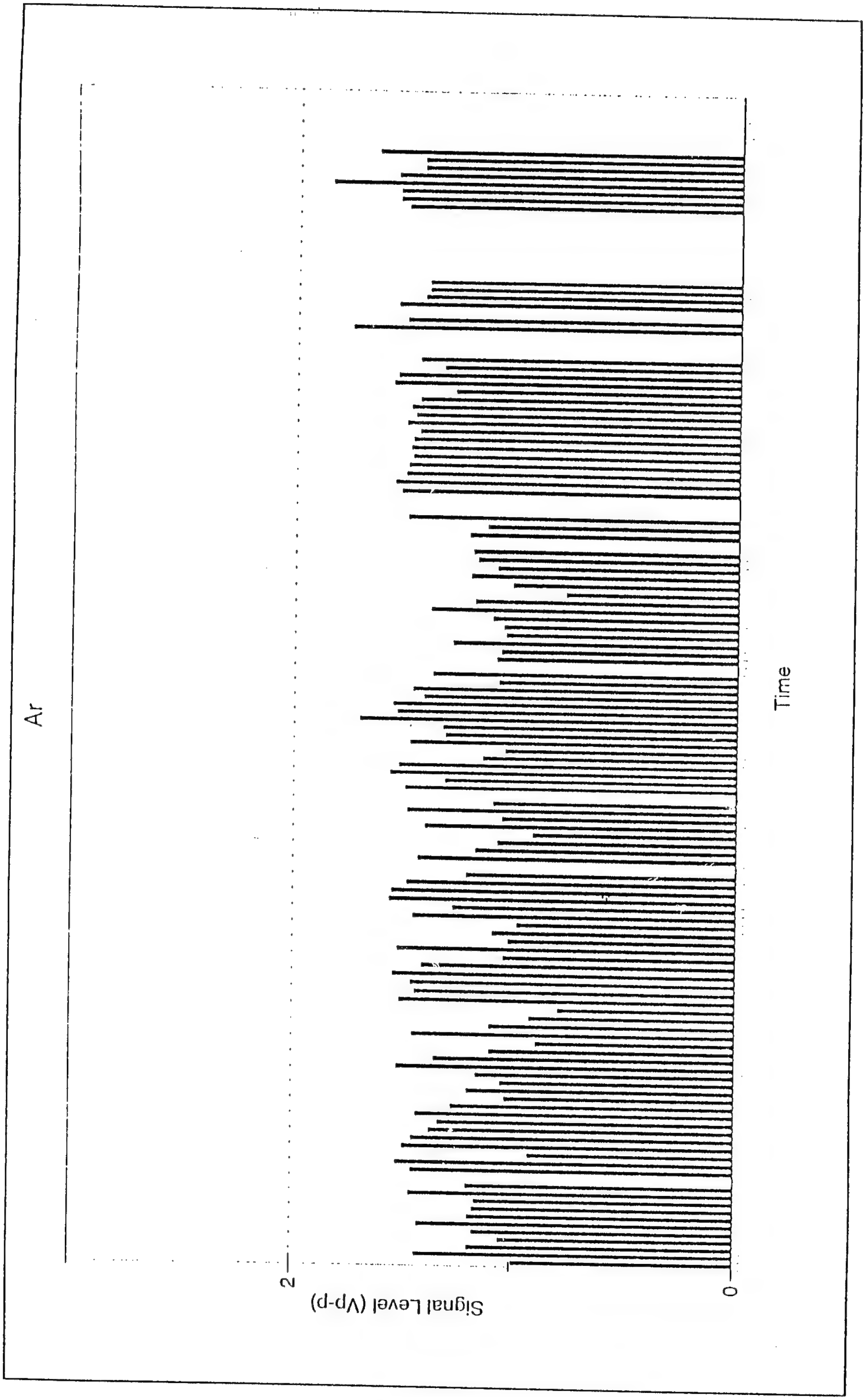

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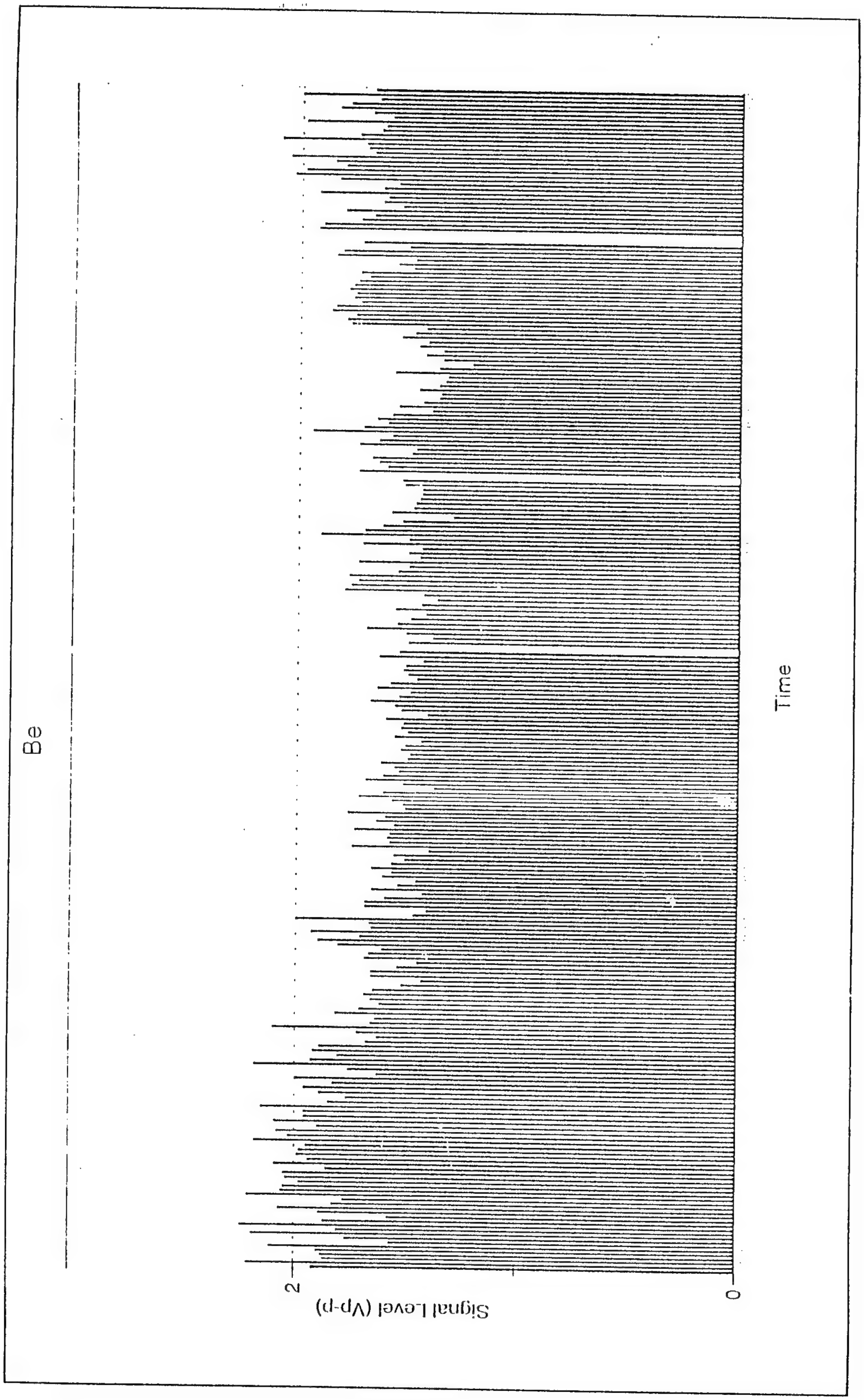
Be
Time
Signal Level (Vp-p)
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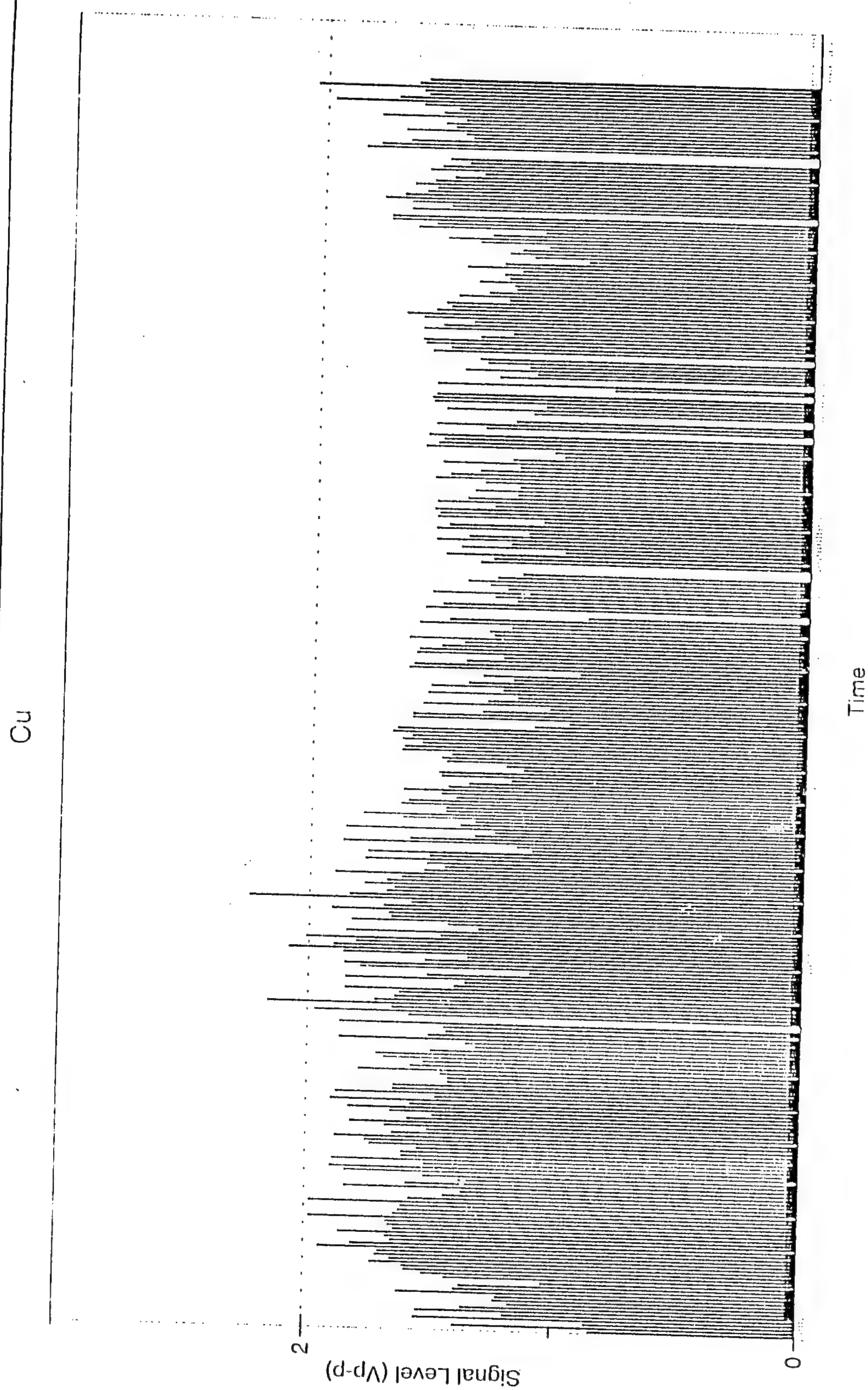

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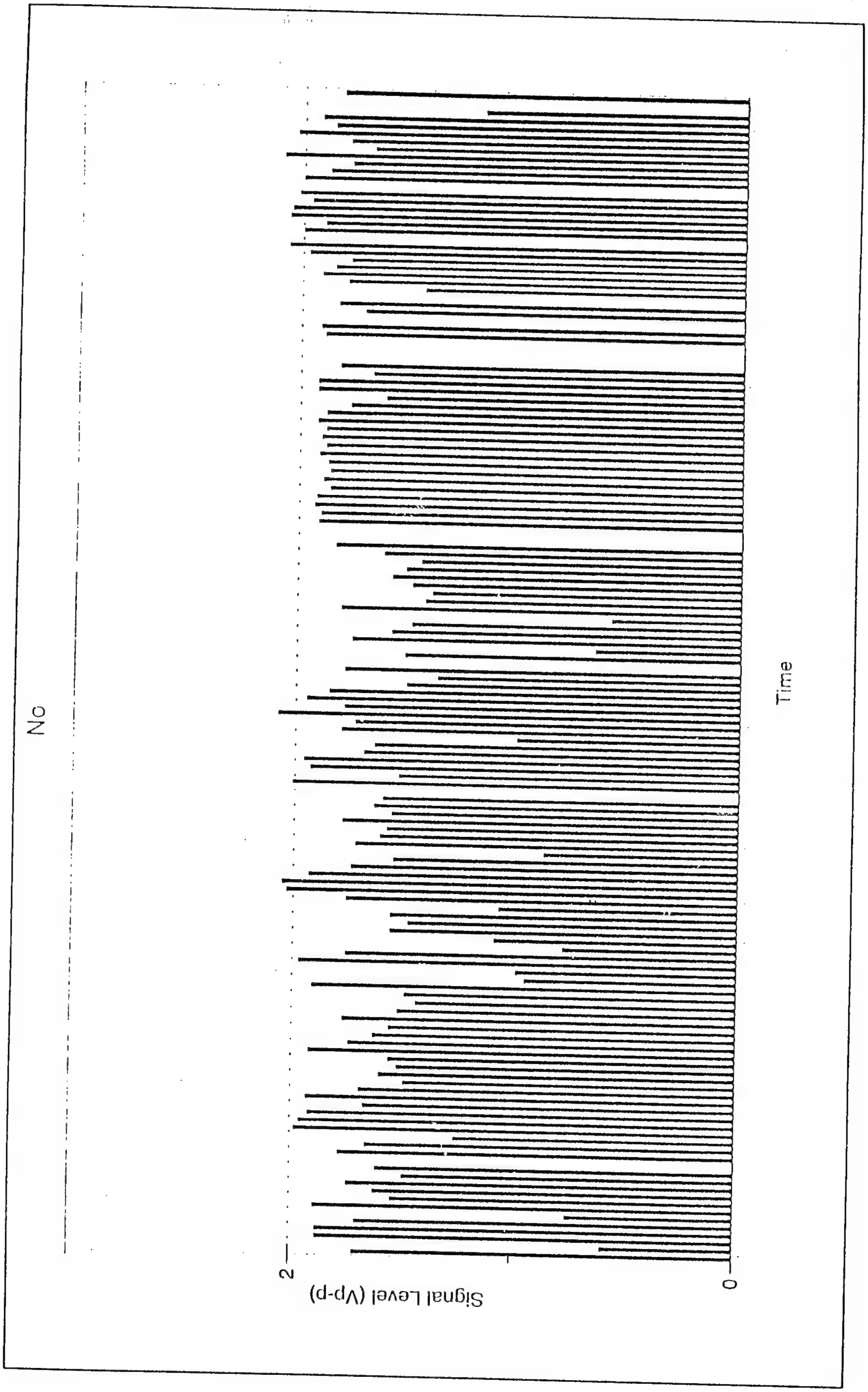
Time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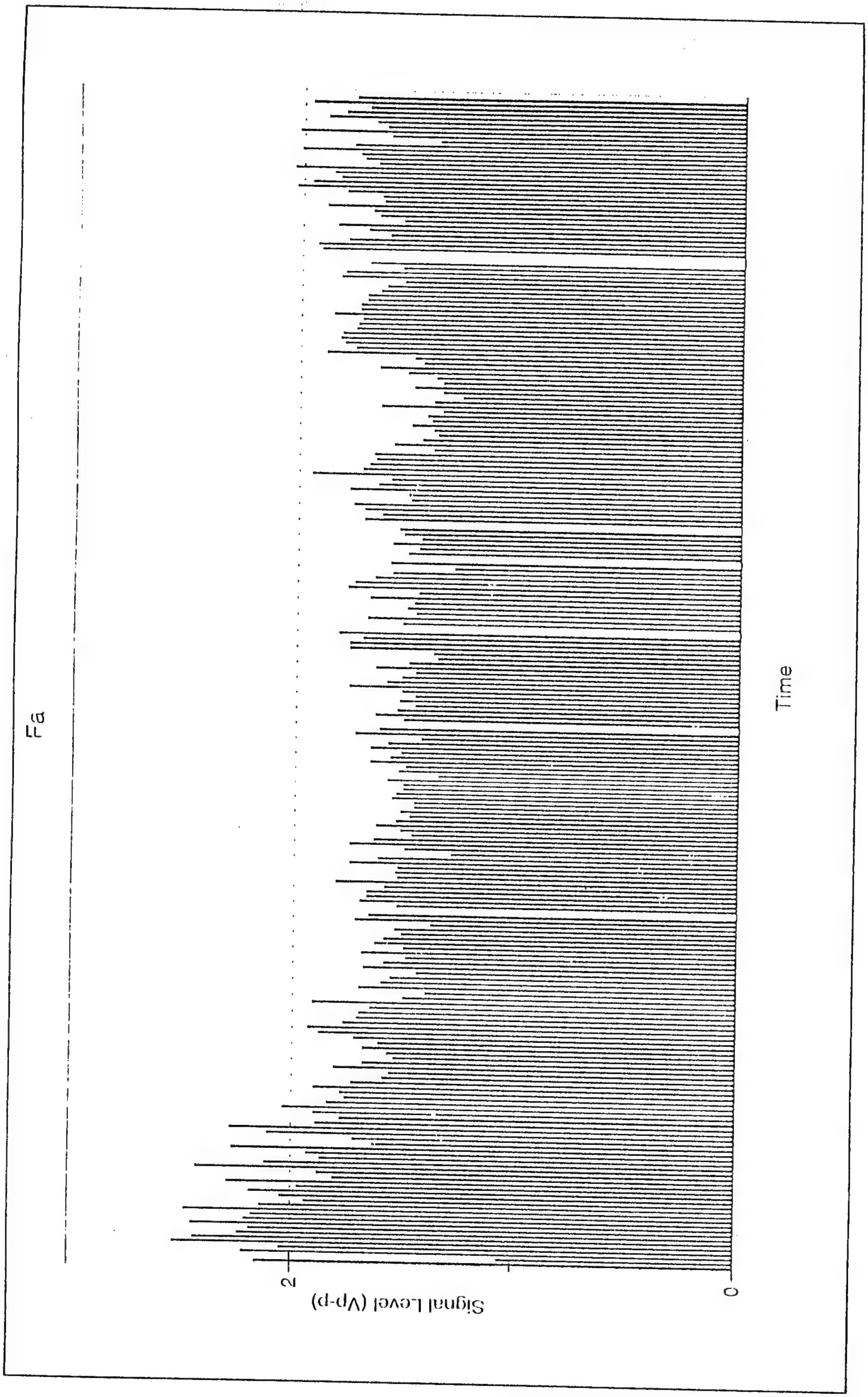
Time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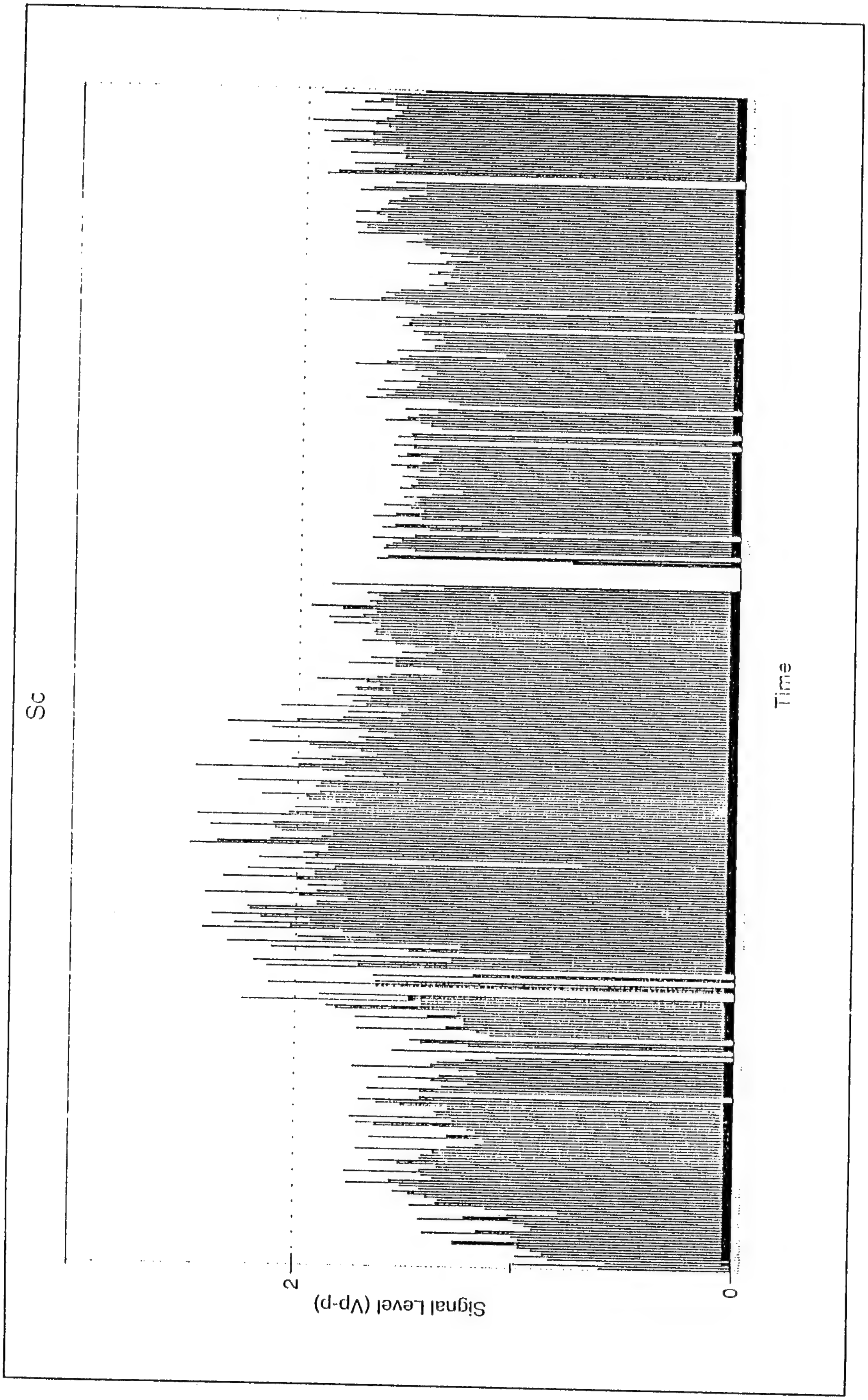
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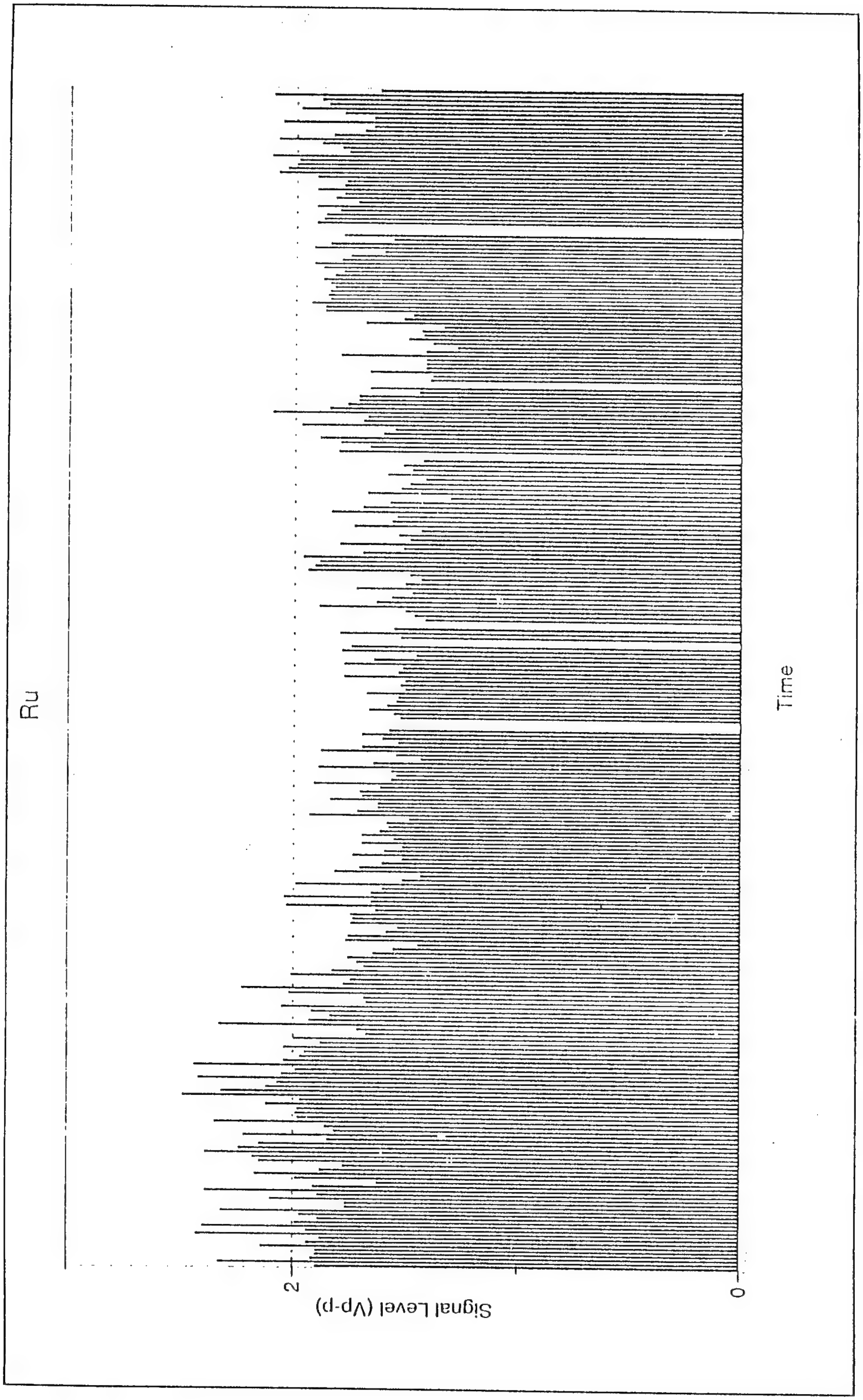
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Time
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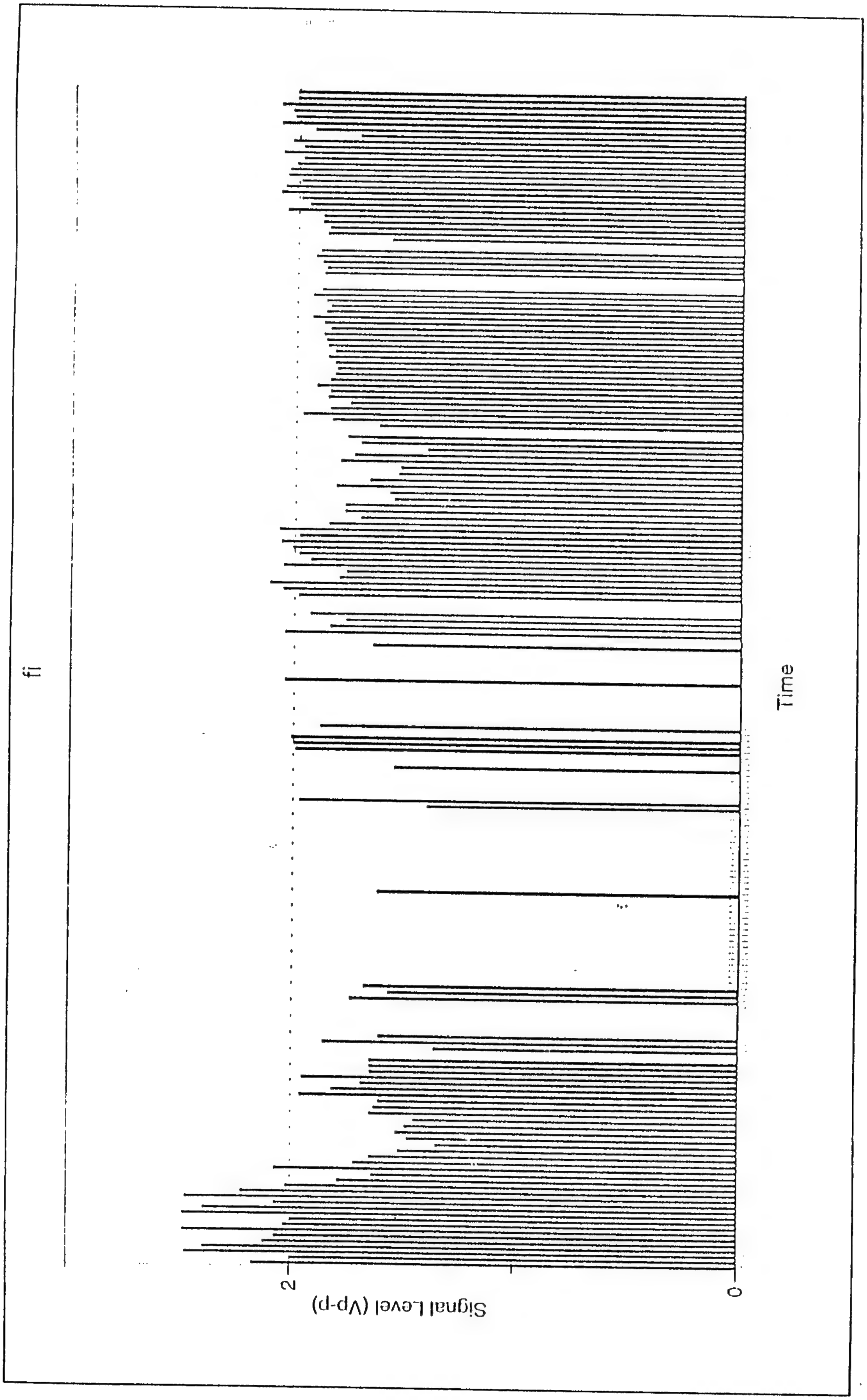
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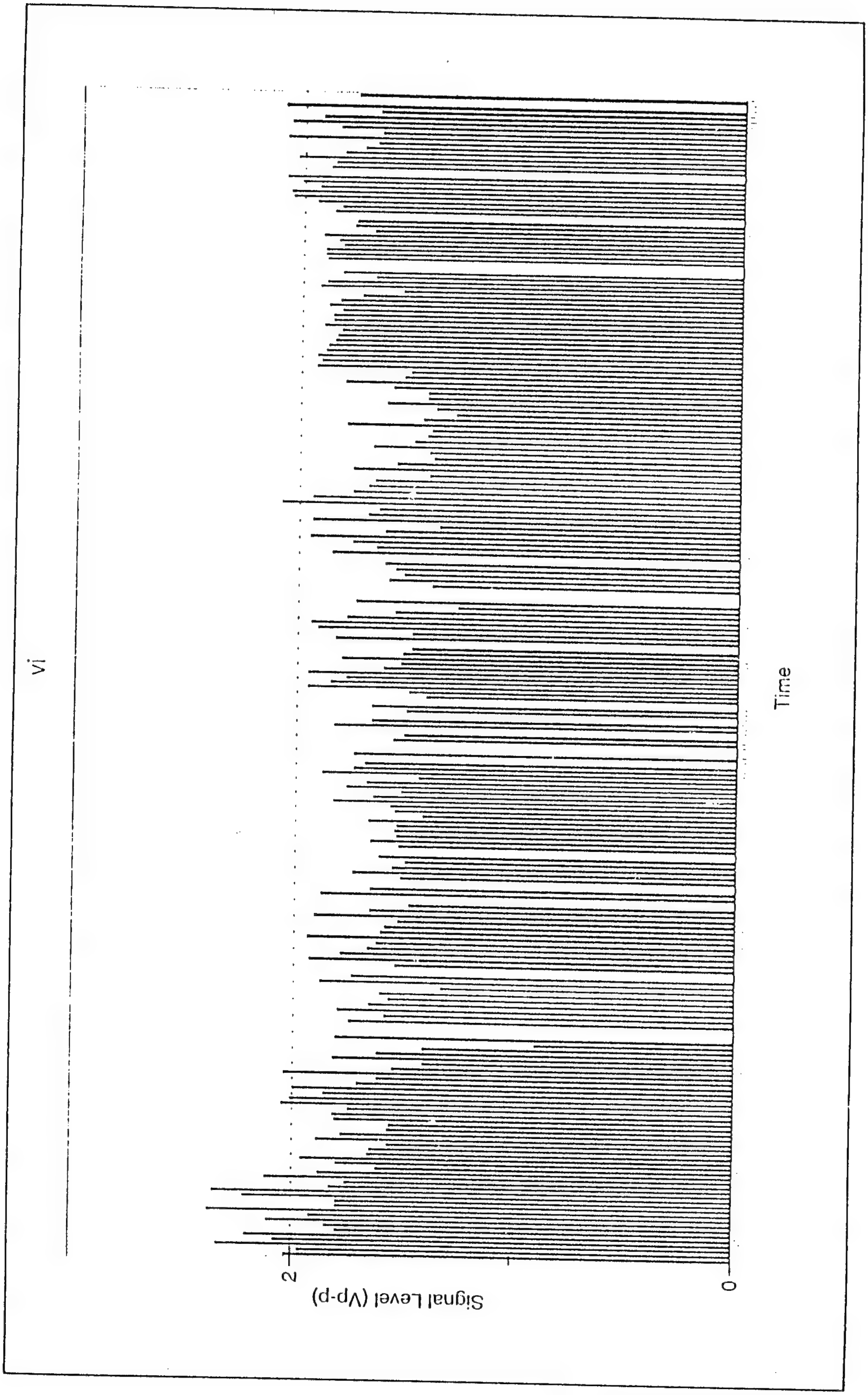
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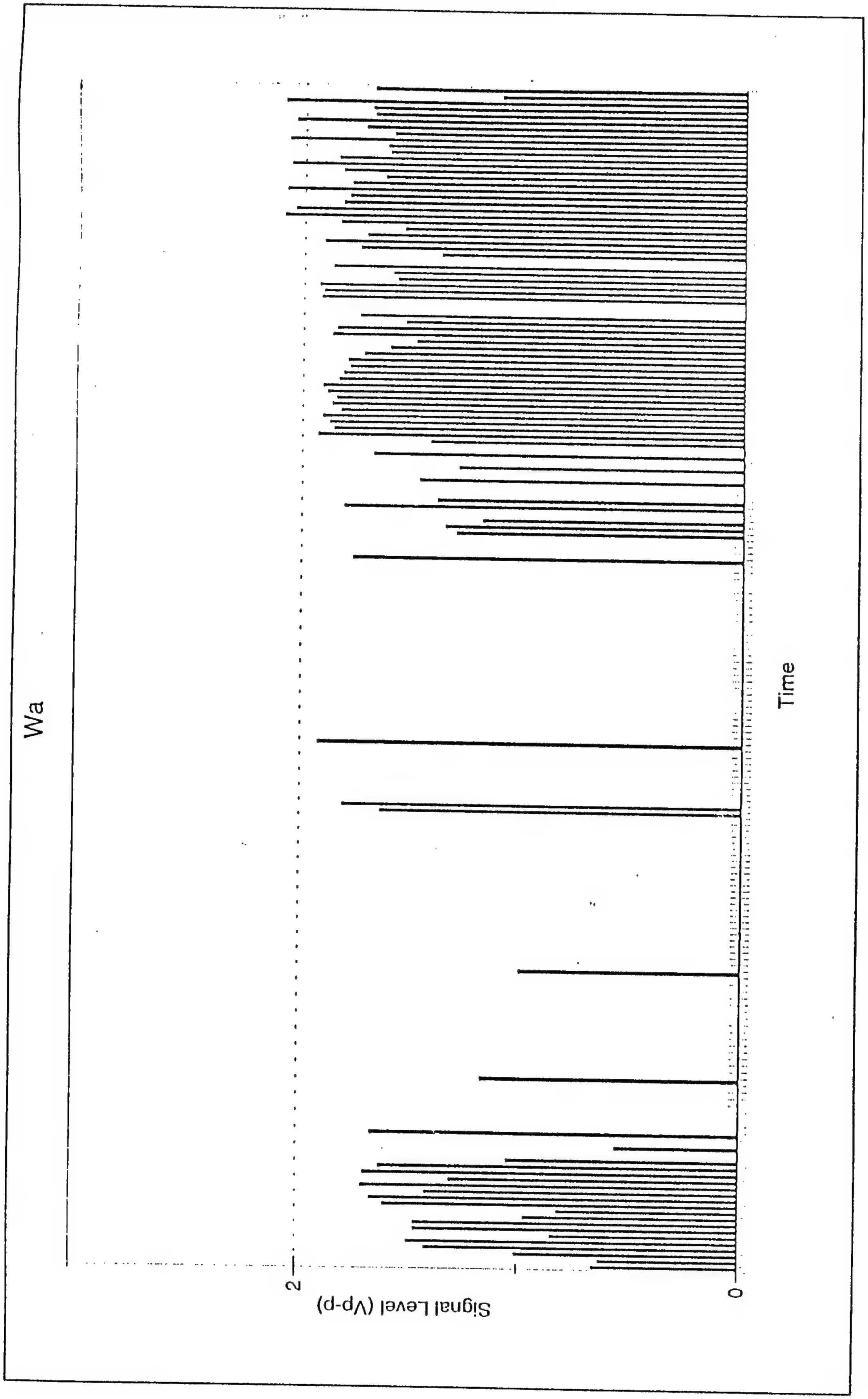
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Signal Level (Vp-p)
2
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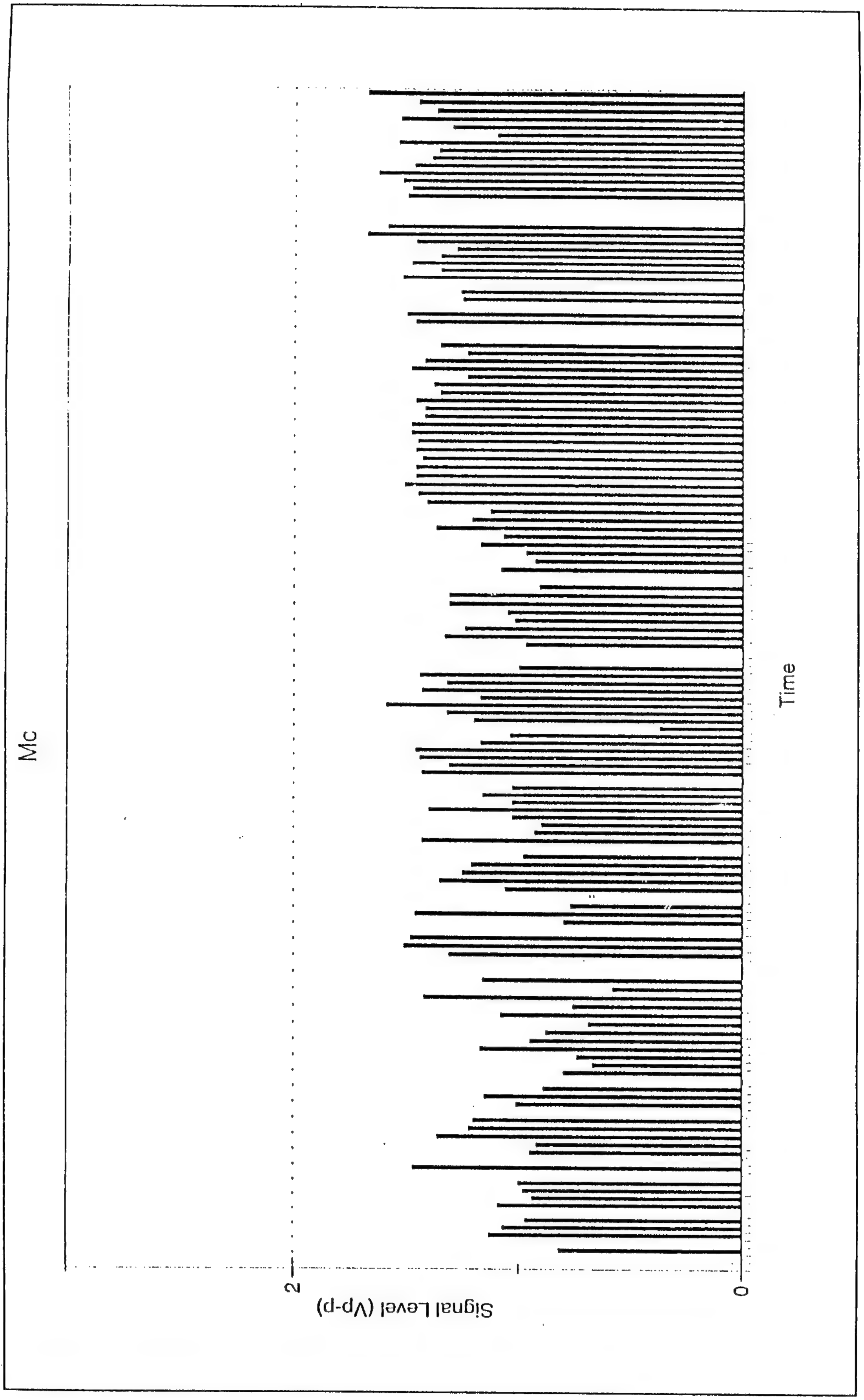
Time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Signal Level (Vp-p)
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Time

APPENDIX E

EQUIPMENT	MODEL NUMBER	PATIENT MONITORING SYSTEM PMS	CENTRAL MONITORING SYSTEM CMS
Dell XPS120 w/32 MB	XPS 120C	$2,258.00	$2,258.00
Coherent CallPort	CAM-200A	$399.00	$399.00
Canon Communication Camera	VCC1-MKII	$1,744.00	$1,744.00
Bush Computer Cart	4206A	$87.22	$87.22
Intel Proshare Video Conferencing Card	Proshare 150	$2,039.00	$2,039.00
CTX TouchScreen Monitor	CTX1765	$1,420.00	$1,420.00
3 ComEthernet Card	EtherLink IIIPCI BusMaster	$80.92	$80.92
Matrox Video Display Card	Millenium w/ 2MB Ram	$344.00	$344.00
YSI Temperature Probes	403	$80.00	$80.00
MTI Stethoscope Receive Unit	1-R Stethocom		$2,450.00
MTI Stethoscope Send Unit	1-T Stethocom	$750.00	
Andreis Tek Stethophone			$50.00
GTEK Serial Port Card 4-Channel with Watchdog	BB4 and B4TM	$235.00	
American Medical Association CD-ROM	Family Medical Guide	$30.00	
Dinamap Interface Cable	ILC-232	$125.00	
Johnson & Johnson Dinamap	Vital Signs Monitor - # 8720	$4,995.00	
Miscellaneous	Cables, power strips, etc.	$200.00	$200.00
TOTAL		**$14,787.14**	**$11,152.14**

APPENDIX F

ASSESSMENTS

CARDIOVASCULAR

ECONOMIC

ENDOCRINE

ENVIRONMENTAL

FAMILY

FUNCTIONAL

GASTROINTESTINAL

HEMATOLOGIC

INTEGUMENTARY

MUSCULOSKELETAL

NEUROLOGICAL

PSYCHOSOCIAL

PULMONARY

RENAL/URINARY

REPRODUCTIVE

HISTORY

NATURE AND DURATION OF COMPLAINTS (INCLUDING CIRCUMSTANCE OF ADMISSION)

HISTORY OF PRESENT ILLNESSES

PAST HISTORY:

1 OCCUPATION (CIVILIAN AND MILITARY)
2. MILITARY HISTORY
3. HABITS- (ALCOHOL, TOBACCO, DRUGS)
4. FAMILY HISTORY
5. CHILDHOOD ILLNESSES
6. ADULT ILLNESSES
7. OPERATIONS
8. INJURIES
9. DRUG SENSITIVITIES
10 ALLERGIC REACTIONS

PHYSICAL EXAM

1. General appearance and Mental Status
2. Head and neck (generaal)
3. Eyes
4. Ears
5. Nose
6. Mouth
7. Throat
8. Teeth
9. Chest (general)
10. Breast
11. Lungs
12. Cardiovascular
13. Abdomen
14. Genitalia
15. Pelvic
16. Rectal
17. Prostate
18. Back
19. Extremities
20. Neurological
21. Skin

CARDIOVASCULAR ASSESSMENT

PAST HISTORY

CARDIOVASCULAR DISORDERS

- Hypertension
- Congestive Heart Failure
- Stroke
- Coronary Artery Disease
- Myocardial Infarction
- Thrombophlebitis
- Leg ulcer, varicose veins
- Arterial insuffiency
- Heart Surgery (by-pass, valvular)

SIGNS AND SYMPTOMS OF CARDIAC OR VASCULAR DISTRESS

- Pain in chest, arms, throat, jaw, or extremities
- Heart palpitations
- Dyspnea, orthopnea, cough
- Neck vein distention
- Edema
- Cold, numbness, or tingling of extremities
- Discoloration of extremities
- Dizziness, weakness

FAMILY

- Heart or vascular condition; acute or chronic
- Hypertension
- Coronary heart disease
- Diabetes mellitus
- Asthma
- Stroke
- Obesity

ALLERGIES

- Medications
- Food

ACTIVITIES OF DAILY LIVING

- Sleeping with head elevated
- Abilities for personal self-care, and/or ADL
- Exercising and effect on pulse and respiration
- Homebound status
- Special diet: low cholesterol/fat. low-sodium, low-calorie

PSYCHOSOCIAL HISTORY

Tobacco, caffeine, and alcohol consumption, daily and over period of years
Personality traits
Occupation and work- related stress
Adaptation to illness or chronic condition

PAST TREATMENTS AND DIAGNOSTIC PROCEDURES

Pacemaker insertion
Holter Monitor
Medications (prescribed and OTC) taken for heart or other condition
Cardiac Rehabilitation
Electrocardiogram, echocardiogram, angiogram, cardiac catheterization, x-ray studies, stress test
Laboratory tests for enzymes, lipid panel, electrolytes, prothrombin time
Cardiac or vascular surgery
Angioplasty, laser treatments
Past or recent hospitalizations

PRESENT HISTORY

CHIEF COMPLAINT INCLUDING ONSET AND LENGTH OF TIME PRESENT

SIGNS AND SYMPTOMS

Blood pressure; pulse rate and regularity; apical pulse; factors that cause changes in baselines; changes with position or posture (sitting, standing, lying)
Onset, duration, precipitating factors if any, alleviating factors if relevant
Chest, arm, throat, jaw pain; aching in legs; pain in calf; edema and or redness
Dyspnes, Orthopnea
Palpitations
Edema, weight gain
Changes in pulse rate (slow or rapid), and regularity
Change in memtation; headache
Insomnia, restlessness, fatigue
Changes in skin color (pallor, redness, cyanosis)

KNOWLEDGE OF DISEASE AND PLANNED HOME THERAPY

PRESENT TREATMENTS AND DIAGNOSTIC PROCEDURES

- Laboratory and diagnostic tests and results
- Use of oxygen
- Medication (oral, sublingual)
  - Antihypertensives
  - Vasodilators
  - Cardiotonics
  - Diuretics
  - Anticoagulants
  - Aspirin
  - Nitrates
  - Others

PHYSICAL EXAMINATION

INSPECTION

- Symmetry of chest, legs, and arms
- Pulsations in aortic area, pulmonary area, right ventricular area, apical or left ventricular area)
- Skin of arms, hands, legs, and feet for color and texture (pink, warm, smooth, dry); color change in extremities when dangling or elevated (should return to normal in 10 seconds)
- Hair distribution on legs and arms; clubbing of fingers
- Rashes, scars, ulcers, and exudate and discoloration (brownish color, eschar, irregular shape of ulcer, chronic venous stasis)
- Veins flush with skin surface or venous enlargement
- Capillary refill of nailbeds of less than 3 seconds

PALPITATION

- Skin of extremities smooth, dry and warm to touch
- Masses in extremities or chest
- Pain or tenderness in chest or extremities
- Veins smooth and full or dilated and tortous
- Cardiac thrills (pulsations of the heart that feel like the throat of a purring cat)
- Radial pulse rate and characteristics
- Femoral, popliteal, carotid, temporal, and dorsal pedis pulse rates and characteristics
- Apical pulse, point of maximum impulse (PMI), and other areas of pulsations of the heart
- Edema of the legs; dependent or pitting
- Calf for signs of phlebitis (tenderness, tension)
- Homan's sign: present or absent

AUSCULTATION

Apical and radial pulses, noting rate, regularity, and pulse deficit
Apical pulse, noting rate, regularity and intensity
Blood pressure, using brachial artery and noting Korotkoff signs and pulse pressure
Heart sounds (S1 and S2) , extra heart sounds (S3 and S4)
Murmur, noting timing, location, sound distribution
Clicks and snaps, noting timing, intensity, and pitch
Friction rub
Carotid artery for bruits

ECONOMIC ASSESSMENT

FINANCIAL RESOURCES

Ability to perform financial responsibilities and handle money
Occupation; effect of illness on work and ability to continue with same occupation
Retirement income/effect of illness on limited income
Ability to purchase or rent equipment, supplies, and services used in the home
Possible number of home visits and cost
Programs available to assist:
- Foundations
- Churches
- Voluntary agencies and support groups
- National associations
- Government grants
- Qualifications for Medicaid

Third-party payors:
- Medicare, CHAMPUS
- Private insurance
- Veterans administration
- Public aid

RESOURCES FOR EQUIPMENT AND SUPPLIES

Pharmacy and supply companies
Home health agencies
Home infusion and supply companies (purchase or rental)
Medical supplies companies (disposable and reusable)
Community organizations that offer medical supplies, financial assistance

EYE, EAR, NOSE, AND THROAT ASSESSMENT

PAST HISTORY

EYE, EAR, NOSE AND THROAT DISORDERS

Infections
Glaucoma
Cataracts
Retinal Detachment
Tonsillitis
Deviated septum, nasal polyps
Allergic Rhinitis
Presbyopia, presbycusis
Macular degeneration
Surgery or injury (tonsillectomy, enucleation, cataract, keratoplasty)

SIGNS AND SYMPTOMS OF EYE, EAR, NOSE, OR THROAT DISORDERS

Eye, ear, nose, or throat pain
Discharge from eye, ear, nose
Multiple colds
Halitosis
Buzzing or roaring in the ears
Loss of equilibrium, vertigo
Headaches
Difficulty swallowing
Runny or stuffy nose, epistaxis
Hoarseness
Changes in visual, auditory acuity

FAMILY HISTORY

Eye, ear, nose, and throat disorders: acute and chronic
Allergies
Foods
Medications
Environmental pollutants
Animals
Chemicals
Others

ACTIVITIES OF DAILY LIVING

Effects of visual or auditory impairment
Use of glasses or contact lenses, eye prosthesis
Use of hearing aid, lip reading, signing
Loss of teeth and use of partial or full dentures
Changes in sense of smell or taste
Ability to perform self-care and care of glasses, contacts, prosthesis, dentures, hearing aid; ability to instill eye drops
Response to hair sprays, noise levels, use of cotton swabs to clean ears, mouthwash
Homebound status

PSYCHOSOCIAL HISTORY

Effect of impairment on self-concept and occupation
Personality traits, anxiety, or depression
Home environment exposure to allergens and irritants
Effects of age and emotions on impairment or disease
Adaptation to illness or impairment

PAST TREATMENTS AND DIAGNOSTIC PROCEDURES

Desensitization therapy
Medications (prescribed and OTC) taken for eye, ear, nose or throat conditions or other conditions
Last visit to dentist
Date of most recent hearing and vision testing
Laboratory tests for complete blood count, throat and nasal culture
Skull x-ray studies, ocular procedures, laser procedure
Surgeries such as tonsillectomy; cataract, corneal or retinal surgery; stapedectomy; mastoidectomy; submucous resection; polypectomy
Past or recent hospitalizations

PRESENT HISTORY

CHIEF COMPLAINT, INCLUDING ONSET AND LENGTH OF TIME PRESENT

SIGNS AND SYMPTOMS

Pain or soreness in area
Onset, duration, precipitating factors, if any
Dysphagia, difficulty in chewing
Discharge from eye, ears, nose or throat
Redness, swelling of eye, throat, nasal mucosa
Epistaxis
Changes in sensory perception and acuity
Temperature elevation
Hoarseness, loss of voice

KNOWLEDGE OF DISEASE AND PLANNED HOME THERAPY

PRESENT TREATMENTS AND DIAGNOSTIC PROCEDURES

Laboratory and diagnostic tests and results
Nasal packing, eye covering and dressing
Eye, ear, throat irrigations
Medications (oral, drops, topical)
- Analgesics
- Antibiotics
- Antiinflammatories
- Antiglaucoma agents
- Decongestants
- Others

PHYSICAL EXAMINATION

INSPECTION

Symmetry of eyes, lids, brows, ears
Lids: color, structure, edema, lesions
Conjunctival and scleral color; opacities, markings of iris
Pupil size, shape, equality, reaction
Intactness of extraocular movements
Round, intact lacrimal glands; moisture or dryness of eyes
External ears and auricles for lesions and deformities
External ears and auricles for color, size and position
Canals and tympanic membranes, drainage
Nose deformities, shape, symmetry, color, edema, drainage, bleeding, septal alignment
Lips: color, dryness, cracking, edema, ulcers
Gums, buccal cavity, and throat: color, swelling, bleeding, inflammation
Tonsils (if present) for redness, swelling and pus

PALPATION

Pinnae for firmness, masses, elasticity, pain
Structure of nose
Tenderness in frontal or maxillary sinuses

ENDOCRINE SYSTEM ASSESSMENT

PAST HISTORY

ENDOCRINE DISORDERS
Diabetes Mellitus
Diabetes Incipidus
Addison's Disease
Hyperthyroidism and Hypothyroidism
Pituitary tumor
Surgery (thyroidectomy)

SIGNS AND SYMPTOMS
Weight changes, appetite and hydration changes
Mentation, visual disturbances
Libido, menstrual disorders
Weakness, fatigue, changes in muscle activity
Changes in respiration, pulse, temperature; presence of dyspnea, palpitations
Changes in elimination patterns (bowel and urinary)
Frequent infections

FAMILY HISTORY
Endocrine disorders; acute and chronic
Diabetes Mellitus
Thyroid disease
Hypertension
Obesity

ALLERGIES
Foods
Medications
Iodine

PATTERNS OF DIABETES MELLITUS CARE
Years disease present
Insulin/ hypoglycemic therapy
Special dietary control

ACTIVITIES OF DAILY LIVING
Abilities for self-care and/or ADL
Ability to follow regimen for diabetes mellitus
Special diet: diabetic, low calorie, low fat
Exercise requirements
Homebound status

PSYCHOSOCIAL HISTORY

Tobacco, alcohol use: daily and over periods of years
Personality traits
Stress from occupation or chronic condition
Adaptation to illness or chronic condition
Cultural preferences in diet

PAST TREATMENTS AND DIAGNOSTIC PROCEDURES

Medications (prescribed or OTC) taken for endocrine or other conditions
Ultrasonograms, scans, x-ray studies of skull
Laboratory tests: complete blood counts, glucose, thyroid function, electrolytes
Exposure to or treatment with radiation
Surgery of any gland
Past or recent hospitalizations

PRESENT HISTORY

CHIEF COMPLAINT, INCLUDING ONSET AND DURATION, SEVERITY

SIGNS AND SYMPTOMS

Weakness, fatigue, muscle weakness, twitching, spasms, numbness, tingling, cramping, tremors, wasting, reduced strength
Bone pain, aching
Nervousness, irritability, drowsiness, confusion
Libido changes
Anxiety, depression, apathy, syncope
Pruritis
Headache, malaise
Anorexia, nausea, vomiting
Polyuria, polydipsia

KNOWLEDGE OF DISEASE AND PLANNED HOME THERAPY

PRESENT TREATMENTS AND DIAGNOSTIC PROCEDURES

Diagnostic procedures and test results
Medications (oral, parenteral)
- Insulin
- Hypoglycemics
- Steroids
- Thyroid preparation
- Male/female sex harmones

PHYSICAL EXAMINATION

INSPECTION

Vital signs, height and weight
Symmetry of extremities, edema (location, type, grade)
Skin color, turgor, dryness, oiliness, texture, edema, distribution of fat
Nail texture; hair amount, distribution, texture
Mon face, protruding eyeballs, thickening of tongue, hoarseness, breath odor

PALPITATION

Decreased deep reflexes or absence of reflexes
Thyroid enlargement, hardness, nodules or asymmetry (thyroid not normally palpable)

ENVIRONMENTAL ASSESSMENT

HOME MODIFICATIONS

Call bell, water, tissues, wastebasket, telephone within reach
Space for equipment and supplies near client
Space for storage of extra equipment and supplies
Door wide enough to accommodate wheelchair, commode
Laundry facilities for clothing, linens, supplies
Bathroom, commode within access for use
Hot and cold running water or means to heat water
Ramp or other access to home
Room on first floor (if possible or if client is unable to use stairway) with window, ventilation, temperature control
Scales for weight in bathroom or near bed
Hospital bed, trapeze connection
Chair to assist client to standing position

SAFETY FACTORS

Client's feeling of safety in home
Cleanliness of home, disorder, noise, waste disposal
Safety bars and aids for ambulation and activities of daily living
Refrigeration for foods, medications, supplies
Proper lighting, arrangement of furniture, clear pathways
Frayed or loose wiring or electrical connections, grounding of equipment
Pathways dry and not slippery
Side rails up or bed in low position if client using hospital bed
Ability to perform ADL independently or amount of assistance needed
Isolation or protective isolation procedures carried out
Proper body alignment and positioning if client is on bed rest
Use of restraints; smoking and precautions taken
Presence of allergens, dust, animals, plants, sprays
Use of aids for ADL and to prevent falls
Available emergency numbers to call
Proper cleansing and disinfection of reusable supplies
Proper administration of medications and use of aids to ensure accuracy
Proper hand washing procedure when required
Presence on indoor plumbing vs drawn water and adequate storage for water
Woodstove/kerosene heater safety and use and ability to fuel fire

FAMILY ASSESSMENT

PAST AND PRESENT PHYSICAL HISTORY

Chronic illness of family members
Functional abilities or disabilities
Health practices
Types of practitioners used
Medications taken by family members
Energy levels of family members
Physical strength and ability to perform procedures

PAST AND PRESENT PSYCHOSOCIAL HISTORY

EMOTIONAL STATUS/ MENTAL ABILITIES

Changes in family life caused by client needs
Willingness to perform procedures and care for client
Support of client by member most likely to become caretaker
Family attitude towards illness or disability
Ability of family members to adapt
Ability of family member to set goals, problem solve
Decision maker in the family
Family stressors and ability to cope
Relationship of client and family members
Family arguments, separations, divorces

PSYCHIATRIC DISORDERS

Chronic anxiety in family
Depression of family member
Behavior disorder of family member
General mental health of family
Presence of alcoholism, family violence, suicides, drug abuse

CULTURAL INFLUENCES

Spiritual beliefs
Language barriers, English as a second language
Beliefs regarding health care and health professionals
General values and ethnic identity o f family

FUNCTIONAL ASSESSMENT

GENERAL

Homebound status, complete bed rest, activity restrictions
Independence or dependence in self-care and activities of daily living and desire and willingness to perform and adapt to limitations
Degree of disability or handicap
Presence of artificial limb
Rehabilitation therapy by physical and/or occupational therapist

BATHING/GROOMING

Ability to wash body (shower, tub bath, sponge bath)
Use of aids to bathe (long handles for sponge, mitt on hand, bars in tub or shower, skid-proof tub, stool in tub or shower stall)
Ability to brush teeth, hair (long and built up handles, extension handles, mounted dryer or brush with suction cup, squeeze bottles for shampoo and toothpaste)
Ability to shave or apply makeup (electric or safety razor, makeup kit)
Use of aids to shave and apply makeup (shaving cream, mirror mounted with suction cups, built up handles, hanging mirror around neck.

DRESSING/UNDRESSING

Type of clothing easy to put on and remove (loose fitting; elastic waist; closure with zipper, Velcro; shoes with Velcro closures; wide openings to slip over head or slip on with front open
Ability to dress and undress (buttons, zipper, tie laces, apply shoes and hose)
Use of aids fro dressing (hooks, zippers, long handles for hose and shoes)

TOILETING

Ability to use bathroom, commode, bedpan, urinal
Use of aids for toileting (grab bars; mounted toilet seat with side arms; tongs or mounting for toilet tissue)

FEEDING

Ability to feed self; partial or total assistance; ability to prepare meal
Use of aids for eating (china and flatware with suction cups; flatware with swivel; extension handles on flatware; bumper guard on dishes; bib for droppings; cuff to hold utensils)
Use of aids for drinking (grippers on cup or glass; large handles; long, bending straws; suction cups for cup or glass)

MOBILITY

Ability to walk, sit, stand, or lie down; amount of assistance needed
Use of aids for mobility and movement (wheelchair, walker, crutches, cane, braces, elevated chair, adjustable seat or ejector chair, footstool, trapeze, holding rails, mechanical lift), hospital bed (electric or semielectric)

GENERAL ACTIVITIES

Book holder; tilted table; clipboard; holder for pencil; card or pad holder; mounts on chair for radio, books; remote control for electric appliances
Cars with special modifications, use of vans or buses with wheelchair lift
Magnifiers, large-print reading materials and telephone; amplifier on phone; special wiring for turning lights on or to alert client if deaf
Automatic dialer and speaker phone attachment

GASTROINTESTINAL SYSTEM ASSESSMENT

PAST HISTORY

GASTROINTESTINAL DISORDERS

Peptic ulcers
Inflammatory bowel disease
Diverticulosis
Hepatitis
Cirrhosis
Enteritis
Gallbladder disease
Hemorrhoids
Hernia
Esophageal Varices
Gastrointestinal hemorrhage or surgery

SIGNS AND SYMPTOMS OF GASTROINTESTINAL DISEASE

Nausea, vomiting
Weight changes
Anorexia
Indigestion/heartburn
Dysphagia
Constipation
Diarrhea
Blood in vomitus or stool
Abdominal pain/distension

FAMILY HISTORY

Gastrointestinal disorders: acute and chronic
Ulcers
Hemorrhoids
Colorectal malignancies
Hepatitis
Obesity

ALLERGIES

Foods
medications

PATTERNS OF BOWEL ELIMINATION AND NUTRITION INTAKE

Characteristics, frequency, color, and amount of stool
Increases flatus
Laxatives or enemas used; type and frequency
Food likes and dislikes, appetite, amount, frequency, ability to chew, dentures and denture pain
Caloric intake (24 hour intake)
Cultural influences
Weight loss or gain/ ideal body weight

ACTIVITIES OF DAILY LIVING

Abilities for self-care (feeding and toileting)
Special diet; low or high calorie
Homebound statues

PSYCHOSOCIAL HISTORY

Tobacco, caffeine, alcohol use: daily and over period of years
Personality traits
Stress, anxiety, and effect on elimination and nutrition
Adaptation to illness or chronic condition

PAST TREATMENTS AND DIAGNOSTIC PROCEDURES

Presence of bowel diversion: type, care and response
Medications (prescribed and OTC) taken for gastrointestinal or other conditions
Proctoscopy, gastroscopy, colonoscopy, scans, magnetic resonance imaging (MRI), stomach and bowel x-ray studies, gallbladder x-ray studies, liver biopsy
Stool for occult blood, ova, parasites, toxins, culture
Gastrointestinal or mouth surgery
Past or recent hospitalizations

PRESENT HISTORY

CHIEF COMPLAINT, INCLUDING ONSET AND LENGTH OF TIME PRESENT AND SEVERITY

Pain and characteristics
Anorexia, nausea, vomiting
Heartburn, flatulence, eructation
Constipation, diarrhea, absence of bowel movements
Weight changes
Jaundice, pruritis
Blood in vomitus or stool; black, tarry or chalky stool; coffee-ground vomitus

KNOWLEDGE OF DISEASE AND PLANNED HOME THERAPY

PRESENT TREATMENT

Diagnostic procedures and results

Results of complete blood counts, electrolytes, blood urea nitrogen, bilirubin, lipase, amylase, and other laboratory tests

Nasogastric tube feedings, total parental nutrition

Gastric decompression, sectioning

Enemas, bowel irrigation

Medications (oral, rectal)

- Vitamins
- Antacids
- Antiemetics
- Antidiarrheals
- H2 antagonists
- Laxatives, stool softeners, suppositories
- Others

PHYSICAL EXAMINATION

INSPECTION

Body contour, abdomen, umbilicus (shape, protrusion, size)

Height and weight, noting amount over or under normal for age, size, sex and frame

Skin: rash, smoothness, scars, edema, color

Drainage from nasogastric tube or ostomy

Stool and vomitus for abdominal constituents or consistency

Mouth for pain, caries, dentures stomatitis, lesions, bleeding, odor

Anus for pain, itching, inflammation, bleeding, hemorrhoids

Jaundice of skin, sclera, and mucus membranes

AUSCULTATION

Absence of bowel sounds for 5 minutes in four quadrants

Presence of bowel sounds in four quadrants, including frequency, pitch, loudness, rushing, swishing, gurgling

PERCUSSION

Abdominal distention for dull, tympanic, or wavelike sounds

Bladder distension for dull sounds

PALPATION

Abdominal masses, pain, nodes, distension, tautness, warmth or coldness

Skin turgor

HEMATOLOGIC ASSESSMENT

PAST HISTORY

BLOOD DISORDERS AND DISORDERS OF BLOOD FORMING ORGANS

Anemias
Leukemia, lymphoma
Immune disorders
Hemophilia
Other blood dyscraaias
Surgery (splenectomy)

SIGNS AND SYMPTOMS OF HEMATOLOGIC DISEASES

Weight loss
Fatigue, weakness, pallor, shortness of breath
Pain in bones or joints
Bleeding from any site, bruising on body parts
Enlarged nodes

FAMILY HISTORY

Hematologic disorders: acute and chronic
Anemias
Hemophilia
Sickle Cell Trait
Allergies
Malignancies

ALLERGIES

Foods
Medications
Chemicals

ACTIVITIES OF DAILY LIVING

Abilities for self-care and/or ADL
Special diet; high iron, folic acid
Homebound status

PSYCHOSOCIAL HISTORY

Personality traits
Life-style, including drug habits and sexual preference
Occupation and exposure to chemicals, lead, and other toxic agents or environmental pollutants

Alcohol consumption: amount and duration
Adaptation to illness or chronic condition

PAST TREATMENTS AND DIAGNOSTIC PROCEDURES

Transfusions of blood or blood products and response
Bone marrow transplant
Medications (prescribed and OTC) taken for hematologic or other condition
Bone marrow puncture, scans, node biopsy
Laboratory tests: complete blood count, platelets, reticulocytes, prothrombin time, iron level
Past or recent hospitalizations
Surgery of any kind

PRESENT HISTORY

CHIEF COMPLAINT, INCLUDING ONSET AND LENGTH OF TIME PRESENT

SIGNS AND SYMPTOMS

Changes in behavior, level of consciousness
Fatigue, weakness, dizziness, headache, pallor, shortness of breath
Pain in bones or joints, mouth or tongue
Anorexia, nausea, emaciation
Night sweats
Small or large hemorrhages on skin
Bleeding from any site (prolonged or excessive)

KNOWLEDGE OF DISEASE AND PLANNED HOME THERAPY

PRESENT TREATMENTS AND DIAGNOSTIC PROCEDURES

Laboratory and diagnostic tests and results
Medications (oral , parenteral)

- Antiinfectives
- Antiinflammatories
- Immunosuppressives
- Antineoplastics
- Tranquilizers
- Antituberculins
- Iron, folic acid
- Vitamin B12
- Others

PHYSICAL EXAM

INSPECTION

Vital signs, height and weight

Ecchymoses or petechiae
Buccal cavity for edema, redness, bleeding, ulceration
Skin color, texture, pruritis
General appearance for dehydration, cachexia

PALPATION

Size of liver, spleen
Lymph nodes: enlargement, tenderness, movement, size, and consistency in neck, axilla, and inguinal areas
Joint swelling

INTEGUMENTARY SYSTEM ASSESSMENT

PAST HISTORY

SKIN DISORDERS
Dermatitis
Acne
Eczema
Infestations, scabies, lice
Infections of skin, nails, scalp
Skin malignancy
Integumentary surgery (graft, cosmetic)

SIGNS AND SYMPTOMS OF INTEGUMENTARY DISORDERS
Alopecia
Dandruff
Itching, breaks in skin
Brittleness, ridging, redness, swelling of nails and cuticles
Tendency to have infections, herpes simplex
Sensitivity to sun, soaps, deodorants, perfumes, others
Dryness, oiliness, excessive moisture, body odor
Skin color changes
Lumps or growths on the skin
Bruising, delayed healing
Ulcerations on extremity

FAMILY HISTORY
Integumentary disorders: acute and chronic
Allergies, eczema

ALLERGIES
Foods
Medications
Cosmetics
Environmental contacts

ACTIVITIES OF DAILY LIVING
Pattern of bathing, with frequency and time, soap used, toothpaste, shaving cream, and razor used, lotion and powders used
Pattern of hair and nail care, with shampoo, rinse, nail polish used, hair tint used, cutical trimming of toenails and fingernails
Ability to perform personal self-care
Homebound status

PSYCHOSOCIAL HISTORY

Personality traits, anxiety
Effect on body image if dermatitis or scarring present
Occupational exposure to irritants such as dyes, sprays, perfumes, allergens
Home environment exposure to allergens or irritants
Adaptation to skin condition and effect on self-concept

PAST TREATMENTS AND DIAGNOSTIC PROCEDURES

Desensitization therapy
Medications (prescribed and OTC) taken for skin, hair, and nail conditions
Skin biopsy
Past or recent hospitalization

PRESENT HISTORY

CHIEF COMPLAINT, INCLUDING ONSET AND LENGTH OF TIME PRESENT

SIGNS AND SYMPTOMS

Changes in skin color, eruptions, breaks, and precipitating factors
Hair loss and precipitating factors
Nail changes and precipitating factors
Injury from burns, with degree of damage to skin and pain

KNOWLEDGE OF DISEASE AND PLANNED HOME THERAPY

PRESENT TREATMENTS AND DIAGNOSTIC PROCEDURES

Laboratory and diagnostic tests and results
Medications (oral, topical)
- Antiinflammatories
- Antipruritics
- Antianxiety agents
- Antibiotics
- Antiacne agents
- Others

PHYSICAL EXAM

INSPECTION

Skin color for cyanosis, redness, jaundice, pallor, pigmentation
Bleeding, bruising
Presence of striae, rashes, urticaria, bites
Skin dryness, oiliness, sweating, peeling, scaling, crusting
Pruritis, odor, exudate, cleanliness
Presence of edema, pain, breaks, or incision
Lesions, lipomas, keloids, warts, nevi, with location and distribution

Blisters, cellulitis, superficial infections
Nail cleanliness, texture, thickness, angle, ingrown nails or hangnails, presence of infection
Hair cleanliness, quality, texture, distribution, colors, odors, brittleness, oiliness or dryness; dandruff; baldness
Scalp infestations, lesions

PALPITATION

Skin temperature (hot or cool), texture (rough bumpy, smooth, thin, thick)
Skin turgor, elasticity, moisture, motility
Tumors, cysts, or any elevation of lumps on skin or scalp
Capillary return in nail plate when pressed

MUSCULOSKELETAL SYSTEM ASSESSMENT

PAST HISTORY

MUSCLE, BONE AND JOINT DISORDERS

Arthritis and type
Bursitis
Fractures
Gout
Low Back Syndrome
Osteoporosis
Paget's Disease
Ruptured Disk
Bone Malignancy
Neuromuscular Disease
Musculoskeletal surgery or injury (amputation, hip/knee replacement, laminectomy)

SIGNS AND SYMPTOMS OF MUSCULOSKELSTAL DISORDERS

Pain, swelling in joints
Muscle weakness, twitching or deterioration
Poor coordination or balance in walking or other movements
Changes in range of motion (ROM) and activity and mobility
Presence of cast or splint or use of traction for fracture or to provide support
Paralysis
Burning, numbness, tingling in extremities
Contracture(s), abnormal body alignment
Pathologic fractures

FAMILY HISTORY

Joint or bone disorders; acute and chronic
Neurologic motor deficits
Neuromuscular disease
Musculoskeletal disease

ALLERGIES

Foods
Medications
Chemicals

ACTIVITIES OF DAILY LIVING

Abilities for self-care and/or ADL
Use of aids for eating, toileting, dressing, personal hygeine/care
Ability to use hands and fingers to grasp, hold objects
Ability to walk; energy and endurance and effects on joints
Special diet; low uric acid, high calcium, low calorie

Homebound status

PSYCHOSOCIAL HISTORY

Tobacco, alcohol, and chemical consumption; daily amd over period of years
Personality traits
Occupation and need for mobility and dexterity; proneness to accidents
Adaptation to disability or chronic illness

PAST TREATMENTS AND DIAGNOSTIC PROCEDURES

Medications (prescribed and OTC) taken for bone, muscle and joint disease
Physical and occupational therapy and rehabilitation
Cold or hear applications
X-ray studies, scans, electromyogram, myelogram
Laboratory tests for electrolytes, uric acid, sedimentation rate, rheumatoid factor, complete blood count, alkaline phosphatase
Use of TENS stimulator
Bone or joint surgery, use of cast or traction
Past or recent hospitalizations

PRESENT HISTORY
CHIEF COMPLAINT, INCLUDING ONSET AND LENGTH OF TIME PRESENT

SIGNS AND SYMPTOMS

Pain in affected area
Redness, swelling, warmth in affected area
Weakness, fatigue
Loss of mobility, coordination or balance, or weight-bearing ability
Limited ROM
Loss of sensation in extremity
Muscle spasms, reduced muscle strength and mass
Diminished peripheral pulse in extremities, delayed capillary refill

KNOWLEDGE OF DISEASE AND PLANNED HOME THERAPY

PRESENT TREATMENTS AND DIAGNOSTIC PROCEDURES

Laboratory and diagnostic tests and results
Use of trapeze, cast, brace, traction, aids for ADL
Presence of limb prosthesis
Bed rest, chair, amount of activity allowed
Medications (oral)
- Analgesics
- Antirheumatics
- Antiinflammatories (steroids and nonsteroids)
- Muscle relaxants
- Antibiotics

Stool Softeners
Vitamin and mineral supplement (calcium and vitamin D)
Others

PHYSICAL EXAMINATION
INSPECTION

Symmetey of legs and arms, shoulders, clavicles, scapulae, musculature
Full ROM of all joints; degrees of motion
Ability to sit, lie, get up, stand, walk; posture
Deformities or contractures, deviations, changes in contour
Presence of scoliosis, kyphosis, lordosis, hammer toe
Gait, coordination, balance, and endurance
Body alignment in supine, prone, side-lying positions
Amputation
Presence of enforced immobilization
Skin of casted extremity or body part (pink, warm, dry with sensation present, peripheral pulse felt
Ability oto move toes/fingers on casted part

PALPATION

Warmth and pain at joint(s) or injury
Crepitus from joint motion
Muscles for strength, mass, tone
Reflexes for presence
Tenderness on pressure or movement
Thickening, bony enlargement around joints

NEUROLOGICAL ASSESSMENT

PAST HISTORY

NEUROLOGIC MOTOR AND SENSORY DISORDERS

- Multiple Sclerosis
- Muscular Dystrophy
- Cerebrovascular Accident
- Seizure Disorder
- Head Trauma
- Spinal Cord Injury
- Motor and Sensory Aberrations
- Parkinson's Disease
- Hearing, Vision, Speech Impairments
- Surgeries (Craniotomy, Laminectomy)

SIGNS AND SYMPTOMS OF NEUROLOGIC DISEASE

- Headaches
- Tremors
- Paralysis
- Gait Disturbances
- Mental Retardation
- Behavioral Changes (confusion, disorientation, mood, affect)
- Speech Changes
- Mentation Changes
- Seizure Activity

FAMILY HISTORY

- Neurologic disorders; acute or chronic
- Hypertension
- Stroke
- Epilepsy
- Alzheimer's Disease/ dementia
- Huntington's Chorea
- Diabetes Mellitus

ALLERGIES

- Medications

ACTIVITIES OF DAILY LIVING

Abilities for personal self-care and/or ADL
Amount of independence or dependance
Rest/sleep/nap patterns (hours/24 hours; frequency; times; length; use and effect of sleeping aids, prescribed or OTC; factors that promote or prevent sleep)
Homebound status

PSYCHOSOCIAL HISTORY

Drug alcohol, tobacco consumption, daily and over period of years
Occupational exposure to toxic agents that affect mental functioning
Personality traits
Adaptation to illness or chronic condition

PAST TREATMENTS AND DIAGNOSTIC PROCEDURES

Medications (prescribed or OTC) taken for neurologic or other condition
Cerebral angiogram, lumbar puncture, scans, milligrams, ocular studies, blood flow studies, magnetic resonance imaging (MRI), electroencephalogram (EEG), skull or spinal x-ray studies
Laboratory tests for electrolyte panel, cultures (cerebrospinal fluid, blood)
Cranial or spinal surgery
Past or recent hospitalizations

PRESENT HISTORY

CHIEF COMPLAINT, INCLUDING ONSET, LENGTH OF TIME PRESENT, AND PRECIPITATING FACTORS

SIGNS AND SYMPTOMS

Anxiety
Sleep Pattern changes, insomnia
Headaches, back pain, dizziness
Memory deficits; changes in level of consciousness and behavior
Sensory problems (paresthesia)
Motor problems (imbalance, paralysis, tic)
Quadriplegia, Paraplegia
Fatigue; mood and communication problems
Aggressive behaviors

KNOWLEDGE OF DISEASE AND PLANNED HOME THERAPY

PRESENT TREATMENTS AND DIAGNOSTIC PROCEDURES
LABORATORY AND DIAGNOSTIC TESTS AND RESULTS

Medications (oral)

Sedatives
Hypnotics
Narcotic and non-narcotic analgesics
Tranquilizers
Antidepressants
Anticonvulsanrs
Others

PHYSICAL EXAMINATION
INSPECTION

Vital signs, including temperature

Motor function (gait; coordination; balance; tremors during rest or intentional; ataxia; speech difficulty; dysphagia; symmetry of muscle size; loss of muscle mass; muscle tone for spasticity, flaccidity; muscle strength in upper and lower extremities; involuntary muscle movements; range of motion in all joints)

Sensory function (touch, pain. proprioception, vision, hearing, discriminatory sensation, temperature)

Mental function (level of consciousness; orientation to time, place, and person; memory; attention span; ability to make judgements and problem solve; ability to communicate; anger, agitation; euphoria; depression; lability)

General appearance (posture, personal hygiene, facial expression)

Spinal Nerve Innervation

C-4 Motor function from neck downward
C-5 Raising of arms
C-5 through C-6 Flexion of elbow
C-6 Dorsiflexion of wrist
C-7 Extension of elbow
C-8 Flexion of finger
T-1 Abduction of finger
T-1 through T8 Movement of thoracic musculature
T-6 through T-12 Movement of abdominal musculature
L-1 through L-3 Flexion of hip
L-2 through L-4 Extension of knee
L-4 through L-5 Dorsiflexion of ankle
L-5 through S-1 Extension of great toe
S-1 through S-2 Plantar flexion of ankle
S-3 through S-5 Movement of perianal muscle

Cranial Nerve Innervation

1. Olfactory (sensory-smell); Odor identification, such as coffee, spice, alcohol
2. Optic (sensory-vision): Snellen chart for visual acuity; gross confrontation test; periphery test of four visual-field quadrants.
3. Oculomotor (motor- pupil constriction; eyelid and extraocular movements): Use penlight for pupil constriction; size and shape; ptosis of eyelid; accommodation to finger moving toward nose.
4. Trochlear (motor- eye movement inward and downward); convergence of eyes inward when fingers move towards nose.
5. Trigeminal (motor- temporal, masseter muscles, muscles and lateral jaw movement; sensory- maxillary, mandibular facial and opthalmic sensitivity): Movement of jaw and mastication muscles and the ability to open and close jaws; sensitivity to sharp and dull object applied to each area with eyes closed; sensitivity of cornea to application of cotton wisp.
6. Abducent (motor-eye abduction): Eye muscle movement for disconjugate gaze; eyes not moving together.
7. Facial (motor-facial expressions; sensory-taste): Face and scalp muscle movements; grimacing; closing eyes tightly; discriminating salty and sweet tastes.
8. Acoustic (sensory- hearing with cochlear division and balance with vestibular division): Weber's and Rinne's tests for auditory acuity; balance testing done by physician.
9. Glossopharyngeal (motor- pharynx; sensory-taste and pharyngeal sensation): Swallowing ability and gag reflex; rise of uvula when saying "ah"; taste sensation at posterior tongue, hoarseness.
10. Vagus (motor-pharynx, larynx, palate; sensory- pharynx, larynx): Ability to speak, phonation; swallowing and gag reflex with nerve 9.
11. Spinal accessory (motor- sternocleidomastoid and trapezius muscle movements: Shoulders shrugging and turning head against resistance.
12. Hypoglossal (motor- tongue) Tongue protrusion, deviation, and strength.

PALPATION

Symmetry, shape, masses, depressions of head and muscles
Carotid and temporal pulses, comparing strength and quality bilaterally
Muscles for tone, shape, size, and atrophy
Skeletal muscle reflexes

Biceps and brachioradial (C-5, C-6)
Triceps (C-6, C-7, C-8)
Patellar (l-2, L-3, L-4)
Achilles (S-1, S-2)
Upper abdominal (T-8, T-9, T-10)
Lower abdominal (t-10, T-11, T-12)
Perianal or anal (S-3, S-4, S-5)
Cremasteric (L-1, L-2)

AUSCULTATION

Blood Pressure

Bruits over eyes, temples and mastoid processes

PSYCHOSOCIAL ASSESSMENT

MENTAL AND COGNITIVE LEARNING

PAST HISTORY

Educational level, educational achievements
Attitude towards learning, ambition
Difficulties in achieving educational or vocational goals
Learning disabilities
Interest in and willingness to learn about care and procedures
Ability to listen, comprehend information given
Ability to read and follow written instructions
Vocabulary level and attention span
Memory and ability to recall events
Hearing, visual impairments
English spoken or English as a second language

PRESENT HISTORY

Knowledge and understanding of illness and prognosis
Cerebral function, including orientation, memory, recall, concentration, level of consciousness, communication pattern
Sensory function, including vision, hearing
Physical ability, strength for self-care
Ability to think rationally, make judgements, problem solve
Ability to express need and maintain record of care and procedures

PSYCHIATRIC

PAST HISTORY

Psychiatric treatments, therapist
Institution, including discharge dates
Attitude towards treatments
Medications prescribed, street or recreational drugs used
Alcohol intake, amounts and length of time
Suicide potential and precipitating factors
Family history of mental disorders
Relationships with family members and feelings about family

PRESENT HISTORY

Personal appearance: hygiene, clothing, physical characteristics, posture, mannerisms, facial expressions, gestures
Communication: tone, quality, flow, speed, use of associative looseness, flight of ideas, blocking, mutism, circumstantiality, word salad, echolalia
Mood, affect
Orientation to time, place, and person

Delusions, hallucinations, illusions
Coping ability and skills
Stressors present
Presence of chronic anxiety, worry, depression, insomnia
Lives alone, isolation, support of significant others
Lives with others but isolates self
Participation in social interactions and activities

ADVANCED DIRECTIVES

Awareness of Patient Self-Determination Act and its requirements and need for written information about advance directives
Presence of an advance directive or form for health care:
- Living Will
- Durable Power of Attorney for health care

Family understanding of and conflicts about client's directives
Knowledge of rights of autonomy and consent to or refusal of care in home
Location of the advance directive or a copy

SPIRITUAL

Religious beliefs and practices
Feelings about a supreme being and how this view deals with illness
Feelings about what will happen during illness
Specific people helpful in religious life
Religious symbols of importance (Bible, prayer, rosary, literature)
Rituals of importance (communion, lighting Sabbath candles, Sacrament of the sick)
Religious restrictions (dietary laws, fasting, blood transfusions, medical treatment, birth control, abortion)
Need for church attendance, priest, minister, or rabbi
Identified spiritual leader

OCCUPATIONAL/RECREATIONAL

PAST HISTORY

Type of past employment
Feelings about past employment
Effects on health
Reasons for leaving or changing vocation
Presence of occupational hazards
Hobbies and avocational activities

PRESENT HISTORY

Type of present employment/retirement
Feelings about work/retirement
Activity involved in work
Effect of work environment on health (stress, chemicals, allergens)
Plans for returning to work
Housekeeping tasks (amount, kind, and participation)
Need for more education or wish for vocational retraining
Type, frequency, and degree of participation in play and recreation
Effects on illness on recreational interests/hobbies
Alternative interests and activities while illness is present
Need to change recreational activities permanently
Adaptation to retirement and role changes

PULMONARY ASSESSMENT

PAST HISTORY

Lung and Airway Disorders
- Bronchitis
- Asthma
- Emphysema
- Tuberculosis
- Pneumonia
- Pleurisy, Pleural Effusion
- Lung Malignancy
- Influenza, Colds, and frequency
- Chest surgery or injury

SIGNS AND SYMPTOMS OF RESPIRATORY DISTRESS

- Dyspnea with or without exertion, breathlessness
- Coughing and sneezing: amount and frequency
- Sputum: Amount, consistency, color
- Chest pain
- Wheezing

FAMILY HISTORY

- Respiratory disorders: acute and chronic
- Allergies, eczema

ALLERGIES

- Plants
- Animals
- Foods
- Drugs
- Environmental Pollutants

IMMUNIZATIONS

- Pneumonia
- Influenza

ACTIVITIES OF DAILY LIVING

- Position during sleep for optimal breathing
- Number of pillows used
- Amount of exercise and effects on breathing
- Abilities for personal self-care and/or ADL
- Homebound status

PHYSICAL EXAMINATION

INSPECTION

Symmetry of chest (shape, expansion, movement)
Color of lips, ears and nails
Breathing pattern using mouth, diaphragm, chest, abdomen; use of accessory muscles
Nail bed capillary refill
Clubbing of fingers
Confusion
Fatigue
Restlessness
Diaphoresis

PALPATION

Chest for pain or masses
Skin for warmth, dryness, smoothness
Intercostal muscles for firmness, smoothness, bulging, retraction
Vocal and tactile fremitus and location of increases or decreases
Symmetry of anterior and posterior chest expansion

PERCUSSION

Lung field resonance: hyperresonance, dull sound, flatness, tympany
Pitch, intensity, duration, (anteriorly and posteriorly with bilateral comparison)

AUSCULTATION

Voice sounds for intensity at airways and periphery
Adventitious sounds such as rales, rhonchi, wheezes, stridor; note position in lungs (1/2, 1/4. bases)
Normal breath sounds such as bronchial, tracheal, vesicular, broncho-
vesicular, and whether diminished or absent and location
Breath sounds heard in areas where not expected (abnormal)

RENAL/URINARY SYSTEM ASSESSMENT

PAST HISTORY

KIDNEY AND BLADDER DISORDERS

Renal Failure
Pylonephritis, glomerulonephritis
Calculi
Urinary Tract Infections
Neurogenic Bladder
Prostatic Hypertrophy
Hypertension
Kidney Transplant
Renal and Bladder Surgery

SIGNS AND SYMPTOMS OF RENAL URINARY DISORDERS

Pain in kidney or bladder area
Urinary incontinence, bladder distention
Retention, hesitancy, dribbling, urgency, frequency, burning, dysuria, nocturia
Urine amount, color, odor, sedimentation, hematuria, pus, mucus, clarity and odor
Polyuria, oliguria, anuria
Weight gain
Type and amount of fluid intake and output for 24 hours
Edema, distention, fever, bruising, restlessness, insomia
Skiin: dryness, itching, poor turgor; dry lips and mucous membranes
Mentation changes

FAMILY HISTORY

Renal or bladder disorders: acute and chronic
Congenital or familial renal or urinary conditions
Hypertension
Connective tissue disorder
Diabetes Mellitus

ALLERGIES

Foods
Medications

ACTIVITIES OF DAILY LIVING

Abilities for self-care (toileting)
Special diet: low in salt, potassium, calcium or protein

PSYCHOSOCIAL HISTORY

Tobacco, caffeine, alcohol use; daily and over period of years
Personality traits
Sexually transmitted diseases
Exposure to environmental or occupational nephrotoxic substance (heavy metals, carbon tetrachloride, phenols, pesticides)
Adaptation to illness or chronic condition

PAST TREATMENTS AND DIAGNOSTIC PROCEDURES

Presence of urinary diversion: type, care and response
Medications (prescribed and OTC) taken for renal/urinary or other conditions
Ultrasonogram; scans; intravenous pylogram; x-ray studies of kidney, ureter, and bladder; cystoscopy; kidney biopsy
Laboratory tests for blood urea nitrogen, creatine, urinalysis, urine culture, others
Surgeries, trauma, or use of instruments in manipulation of tract during procedures
Past or recent hospitalizations

PRESENT HISTORY

CHIEF COMPLAINT, INCLUDING ONSET, DURATION, PRECIPITATING FACTORS, ALLEVIATING FACTORS IF RELEVANT

SIGNS AND SYMPTOMS

Pain
Weight gain, edema
Changes in urinary pattern
Changes in urinary characteristics
Anorexia, nausea, vomiting
Thirst, dry skin, poor turgor
Weakness, muscle cramping
Pruritis, visual changes
Fluid imbalance
Electrolyte imbalance

KNOWLEDGE OF DISEASE AND PLANNED HOME THERAPY

PRESENT TREATMENTS AND DIAGNOSTIC PROCEDURES

- Diagnostic procedures and laboratory results
- Current fluid requirements, restrictions
- Use of urinary drainage devices or catheterizations
- Hemodialysis or peritoneal dialysis
- Dietary restrictions
- Medications (oral)
    - Analgesics
    - Diuretics
    - Antiinfectives
    - Steroids
    - Anticoagulants
    - Others

PHYSICAL EXAMINATION

INSPECTION

- Blood pressure elevation
- Skin color, pruritis, petichiae, ecchymoses, dryness, urate crystals
- Oral mucous membranes dry, redness, ulcerations
- Edema of hands, feet, sacral region, legs; abdominal distention; neck vein distention
- Urinary output and characteristics with or without indwelling catheter
- Behavior changes in regard to alertness, confusion, cognitive ability, level of consciousness
- Fruity or urine odor to breath. foul odor to urine
- Condition of urinary diversion site, dialysis shunt or abdominal site, urinary catheter site

PALPITATION

- Size and movement of kidneys
- Pain in kidney, bladder area
- Bladder distention, abdominal distention

PERCUSSION

- Dullness over bladder if distended

REPRODUCTIVE SYSTEM ASSESSMENT

FEMALE

PAST HISTORY

REPRODUCTIVE DISORDERS

- Sexually Transmitted Diseases
- Tubal Pregnancy
- Abortions
- Pelvic Inflammatory Disease (PID)
- Infertility
- Menstrual Disorders
- Endometriosis
- Breast, uterus, ovarian, vaginal malignancy
- Surgery (mastectomy, hysterectomy)

SIGNS AND SYMPTOMS OF REPRODUCTIVE ORGAN DISORDERS

- Breast pain, tenderness, discharge; change in nipple
- Dyspareunia
- Rashes or irritations of genitalia with pruitis
- Discharge from meatus, vagina
- Dysuria, urinary frequency, retention, incontinence
- Dysmenorrhea, amenorrhea

FAMILY HISTORY

- Breast or reproductive malignancy (ovary, uterus)
- Reproductive disorders: acute or chronic

ALLERGIES

- Scented feminine powders, pads, tampons

ACTIVITIES OF DAILY LIVING

- Birth control use and effectiveness
- Breast self-exam and frequency, pap smear, mammogram
- Ability for toileting and genitalia hygiene
- Presence of indwelling catheter and ability to care for
- Homebound status

PSYCHOSOCIAL STATUS

Personality traits
Number of children, pregnancies
Age at menarche; frequency, duration, regularity of periods; amount of pain, bleeding between periods; last menstrual period
Date or age of menopause, hot flashes, discharge, pain
Intercourse frequency if active; satisfaction level
Sexual orientation, multiple partners if appropriate
Ability to carry out role function to satisfaction
Adaptation to infertility or other chronic condition

PAST TREATMENTS AND DIAGNOSTIC PROCEDURES

Intrauterine device, birth control implant
Medications (prescribed and OTC) taken for gynecologic disorder
Ultrasound, diagnostic dilation and curettage, mammogram, laparoscopy, amniocentesis, breast or endometrial biopsy
Laboratory tests for pregnancy, complete blood count, typing and Rh factor
Surgeries such as mastectomy (simple and radical), hysterectomy, salpingectomy, oophorectomy, cystocele or rectocele repair, tubal sterilization
Past or recent hospitalizations

PRESENT HISTORY

CHIEF COMPLAINT, INCLUDING ONSET AND LENGTH OF TIME PRESENT

SIGNS AND SYMPTOMS

Abdominal pain, dysmenorrhea, amenorrhea
Abnormal vaginal bleeding or discharge
Genital pruritis, irritation
Infertility
Dyspareunia
Dysuria

KNOWLEDGE OF DISEASE AND PLANNED HOME THERAPY

PRESENT TREATMENTS AN DIAGNOSTIC PROCEDURES

Laboratory and diagnostic tests and results
Use of birth control devices
Radiation or chemotherapy
Presence of urinary catheter
Medications (oral, vaginal)
- Hormones
- Antibiotics
- Antiinflammatories
- Analgesics

Fertility therapy
Others

PHYSICAL EXAMINATIONS

INSPECTION (AS APPROPRIATE)

External genitalia for discharge, redness, swelling, ulcerations or lesions, inflammation
Bulging of vaginal walls
Pediculosis pubis
Cervical color, position, ulceration, bleeding, discharge, masses
Vaginal mucosa color, inflammation, ulcers, masses
Breast size, symmetry, contour, moles, dimpling, rash, edema, venous pattern, color
Nipple size, shape, discharge, rash, ulcers, induration

PALPATION

Vaginal muscle tone, nodules, tenderness
Cervical position, shape. mobility, consistency, tenderness
Uterine size, shape, consistency, motility, tenderness, masses
Breast elasticity, fullness, tenderness, nodosity
Nipple elasticity, discharge with pressure
Axillary nodes
Masses in breasts: size, shape, location, consistency, motility, and tenderness

MALE

PAST HISTORY

REPRODUCTIVE DISORDERS

Sexually transmitted diseases
Hernia
Prostatitis
Hydrocele
Epididymitis
Prostatic Hypertrophy
Surgery (prostatectomy, penile implant, orchiectomy)

SIGNS AND SYMPTOMS OR REPRODUCTIVE DISORDERS

Pain in scrota, testes
Discharge from penis
Lesions on penis
Impotence
Urinary difficulty with urgency, frequency, weak stream; difficulty starting or stopping; incontinence; inability to empty bladder

FAMILY HISTORY

Reproductive disorders: acute or chronic

ACTIVITIES OF DAILY LIVING

Scrotal self-examination and frequency
Ability for toileting and genitalia hygiene
Presence of indwelling catheter and ability to care for
Homebound status

PSYCHOSOCIAL STATUS

Personality traits
Intercourse frequency if active; satisfaction level
Sexual orientation; multiple partners if appropriate
Ability to carry out role functions to satisfaction
Effect of impotence on self-concept
Adaptation to illness, impotence, or other chronic condition

PAST TREATMENTS AND DIAGNOSTIC PROCEDURES

Penile device or implant
Medications (prescribed and OTC) taken for reproductive disorders
Cystoscopy, prostate biopsy
Laboratory tests for urinary culture, complete blood count, enzymes
Surgeries such as vasectomy, prostatectomy, herniorrhaphy, orchiectomy, penile implantation

PAST HISTORY

CHIEF COMPLAINT, INCLUDING ONSET AND LENGTH OF TIME PRESENT

SIGNS AND SYMPTOMS
- Urinary abnormalities
- Pain in area
- Bleeding or discharge from penis
- Genital pruritis, irritation
- Penile lesions, ulcers, soreness

KNOWLEDGE OF DISEASE AND PLANNED HOME THERAPY

PRESENT TREATMENTS AND DIAGNOSTIC PROCEDURES
- Laboratory and diagnostic tests and results
- Use of aids/ device for impotence
- Radiation or chemotherapy
- Presence of urinary catheter
- Medications (oral)
  - Analgesics
  - Antibiotics
  - Antspasmotics
  - Antiinflammatories
  - Hormones
  - Others

PHYSICAL EXAMINATION

INSPECTION
- Penis, meatus, scrotum for ulcers, scars, rashes, nodules, discharge, swelling
- Circumcision and cleanliness
- Pediculosis pubis
- Urethral meatus position
- Size and shape of penis for age
- Contour of scrota; testes in place
- Breast and nipple symmetry, lesions, drainage, induration

PALPATION
- Penile shaft for masses, tenderness, induration
- Testes for size, shape, consistency, tenderness, symmetry
- Prostate (rectal examination) softness, swelling, tenderness
- Hernia (via inguinal canal)
- Breasts or nipples for masses, tenderness, discharge on pressure

APPENDIX G

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
1	7/8/96	11:05	11:15	10.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	Audio breakup and video freeze.
1	7/10/96	11:00	11:15	15.00	Base	Clear	Yes	Yes	Yes	No	Not Done	Stethoscope did not work.
1	7/12/96	10:38	10:48	10.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	Frequent return video freeze, occasional audio popping.
1	7/15/96	11:00	11:15	15.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	Audio popping, video freeze.
1	7/19/96	10:55	11:10	15.00	Base	Hot	Not Done	Yes	Yes	Yes	Not Done	Audio popping, video freeze.
1	7/22/96	14:55	15:15	20.00	Base	Partly Clou	Not Done	No	No	No	Not Done	Video freeze, peripherals not working, audio.
1	7/29/96	11:15	11:30	15.00	Base	Clear	Yes	Yes	Not Done	Yes	Not Done	
1	7/31/96	13:26	13:44	18.00	Base	Clear	Yes	Yes	No	Yes	Not Done	
1	8/7/96	11:00	11:13	13.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
1	8/12/96	10:55	11:05	10.00	Base	Cloudy	Yes	Yes	No	Yes	Not Done	
1	8/15/96	9:40	9:55	15.00	Base	Clear	Not Done	Yes	Yes	Yes	Not Done	
1	8/16/96	12:20	12:30	10.00	Remote	Clear	Not Done	Yes	Yes	Not Done	Not Done	Run time error and blue screen during pulse-ox. Required disconnection.
1	8/16/96	12:31	12:40	9.00	Remote	Clear	Not Done	Yes	Yes	Yes	Not Done	
1	8/27/96	11:00	11:15	15.00	Base	Cloudy	Yes	Yes	Not Done	Yes	Not Done	
1	8/30/96	12:03	12:14	11.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
1	9/5/96	13:00	13:10	10.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	
1	9/6/96	11:30	11:48	18.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
1	9/9/96	11:24	11:26	2.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	No remote video at CMS.
1	9/9/96	11:26	11:33	7.00	Base	Clear	Not Done	Not Done	Yes	Not Done	Not Done	PMS has good AV, CMS good audio, no video; RTE unable to disconnect.

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
1	9/10/96	11:18	11:29	11.00	Base	Partly Clou	Yes	Yes	No	Yes	Not Done	
1	9/13/96	12:16	12:36	20.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
1	9/18/96	11:00	11:10	10.00	Base	Clear	Yes	No	No	Yes	Not Done	Had to reboot midway during conference. Unable to take measurements.
1	9/19/96	10:35	10:54	19.00	Base	Clear	Yes	Yes	Not Done	Not Done	Not Done	Audio popping.
1	9/23/96	14:35	14:40	5.00	Base	Clear	Not Done	Not Done	Yes	Not Done	Not Done	
1	9/25/96	10:40	10:55	15.00	Base	Clear	Yes	Yes	Yes	Not Done	Not Done	
1	9/25/96	11:00	11:10	10.00	Base	Clear	Yes	Yes	Yes	Not Done	Not Done	
1	9/27/96	11:00	11:10	10.00	Base	Cloudy	Yes	Not Done	Yes	Yes	Not Done	
2	6/19/96	10:35	11:05	30.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Stethoscope is not working from central office today. Sam is coming from GA Tech in the AM and I will ask him to check on this. We set a time of 0930 - 1000 to connect in the AM.
2	6/20/96	9:52	10:04	12.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Respirations not done. Real time not sufficient.

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
2	6/21/96	10:11	10:31	20.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Stethoscope is not working this morning. Respirations not done. Real time not adequate.
2	6/24/96	10:22	10:31	9.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Stethoscope is not working this morning. Respirations not taken. Real time inadequate.
2	6/25/96	10:14	10:56	42.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	System would not allow me to connect with client or client to connect with me. I spoke to her by phone. Learned from John Searle that we had been disconnected from the system so Jones could work on network. I was not aware prior to this time.
2	6/26/96	10:21	10:33	12.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Video freezing. Real time not adequate for respiratory efforts.
2	6/27/96	10:21	11:00	39.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	System would not allow connection. Spoke with client by phone.
2	6/28/96	10:02	10:13	11.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Respirations not taken. Real time not adequate. Audio breaking up.
2	7/1/96	10:21	11:30	69.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	Unable to connect. States I'm muted on this end & she had no video from here. Rebooted system 3 times. Sky clear & hot about 85. Called John Searles, on vacation. Called Patty Edwards, will call back. Client advised I call her on system if going on line.
2	7/2/96	10:00	10:15	15.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	Unable to connect. States I'm muted from this end and she had no video from here. Couldn't try later in afternoon. Vince and Andy working on system. Client was kept informed and scheduled for 10 am.
2	7/3/96	10:00	10:10	10.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	Unable to connect. States I'm muted from this end and she has no video from here. Contacted Patty Edwards to report trouble.
2	7/9/96	10:00	10:20	20.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Freezing and breaking.

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
2	7/10/96	10:00	10:15	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	1st connection, couldn't hear client. Client said I was breaking up. Disconnected & reconnected, volume started low, but gained within a few minutes. System is slow. BP cuff inflated, but wouldn't deflate. Tried 2nd time, successfully. Volume muffled.
2	7/11/96	10:15	10:30	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	EHC rang 13 times before connecting, line sounded dead, then client began to speak. No video on either end and audio was breaking. Rebooted, tried again. Long freezes on both ends. There was audio and video after long rings before connection.
2	7/12/96	10:25	10:45	20.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	EHC rang eight times before connecting, line sounded dead, then client began talking. After using stethoscope, there was a muffling sound with an echo. BP machine deflated very slowly. Weight never appeared on client's screen.
2	7/17/96	10:10	10:45	35.00	Base	Hot	Not Done	Not Done	Not Done	Not Done	Not Done	There was no video on first connection. We both rebooted and tried again. The CMS unit was completely frozen and didn't allow me to even exit the system. Patty Edwards was called.
2	7/18/96	10:15	10:30	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	EHC rang numerous times before connecting with client. Audio was breaking during entire call. Video was freezing on both ends, however, at the CMS freezing seemed to be longer. A lot of static on the lines.
2	7/19/96	10:05	10:40	35.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	System rang 8 times before conncting. Audio breaking a lot. I never received video of client. Both videos working on client's line. Long delays between parameters being checked. CMS BP clicked, client's monitor still had pulse ox. Couldn't reconnect.
2	7/23/96	9:58	10:03	5.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	No video, poor to fair audio.
2	7/23/96	10:03	10:11	8.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	No video, data error when computer disconnected.
2	7/23/96	10:11	10:12	1.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	No video. Occasional audio popping.

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
2	7/23/96	15:00	15:15	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Connection better this afternoon than this morning. Sam is here and is testing some things on the system.
2	7/24/96	11:15	11:25	10.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	Did not connect. Sam here and I was seeing patient in their homes. Will connect in the AM.
2	7/25/96	11:47	11:58	11.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Visit interrupted, couldn't reconnect. Spoke w/client by phone. On CMS, no measurements recorded in stats. Measurements never came to my screen. Video was of client's lips. Client states camera been that way since nurse connected w/her. I wasn't told.
2	7/29/96	10:15	10:30	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	System freezing for long periods of time.
2	7/31/96	10:14	10:22	8.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	No remote to me. Client had video. Audio better without many breaks, still clipping. My remote video came on screen four minutes after connecting. A lot of static. Patient wasn't moving anything to cause this. Long freezes.
2	8/5/96	9:53	10:01	8.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	System rang eight times before connection. Chart kept popping off on client's system when using stethoscope. No remote video to me. Client had local and remote video.
2	8/7/96	10:12	10:20	8.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Smoother setting, no audio/video breaks. Sharper setting, picture freezing & audio was awful. Had to call client to see what she was saying while on the system. She wasn't going to be home during calls from MCG this afternoon to get comparison data.
2	8/12/96	10:00	10:12	12.00	Base	Raining	Yes	Yes	Yes	Yes	Not Done	First connection with new software & new setting. Mike Barrow to install RF Modem today. Audio to video was slow. Some lag time. Video freezes and no pixel on the video. There were popping sounds, determined was stethoscope & headphones close together.
2	8/19/96	11:30	11:50	20.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Sam here for connection. Some breaking and freezing. Pulse ox reading never came over my screen After measurement was done, system disconnected. Sam said the ISDN lines had dropped. I reconnected with her to complete the measurements.

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
2	8/20/96	10:38	10:54	16.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	During use of stethoscope, there was a lot of audio breaking. Better video today.
2	8/26/96	10:42	11:05	23.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Numerous freezes and breaks. After pulse ox was completed, the system disconnected. Reconnected without further problems.
2	8/27/96	10:46	10:55	9.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	Pixels noted on video. This was probably the best connection ever. Audio and video were better.
2	9/3/96	10:25	10:42	17.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	After taking blood oxygen reading, system disconnected. Reconnected, but measurements didn't appear on my screen. Client rebooted. Reconnected to complete the visit. Audio freezing and video breaking noted.
2	9/4/96	11:22	11:30	8.00	Base	Cloudy	Not Done	Yes	Yes	Not Done	Not Done	Patty called this AM to say Harry reported they had made some changes on client's connection this AM. We connected, went through two measurements and had a run time error on client's side. She rebooted and we were not able to reconnect.
2	9/10/96	9:48	9:53	5.00	Base	Cloudy	Not Done	Not Done	Not Done	Not Done	Not Done	Connected w/client. Began pulse ox & system told client she had error taking measurement. Client is properly attached to ox. Tried 2nd time & client had "run time error". Rebooted & reconnected successfully. Called Barry at MCG, she has corrupt file.
2	9/17/96	10:18	10:31	13.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	Freezing video and breaking audio. A lot of collisions.
2	9/18/96	9:49	9:58	9.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Freezing video and breaking audio. Weight from PMS not transferred to CMS.
2	9/23/96	9:39	9:44	5.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	Connected, "error" during BP. Rebooted. Hangup was very slow. Had second "error" ("Disk I/O Error during reading.)" The BP measurement was on the PMS, but never transferred to the CMS. A lot of freezing video and breaking audio.

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
2	9/24/96	9:25	9:34	9.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Connected, lines down, reconnected without problems.
3	7/29/96	10:30	10:47	17.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Freezing video - breaking audio
3	7/31/96	9:55	10:10	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Some freezing and audio breaks.
3	8/7/96	10:26	10:41	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	On smoother setting, was only one clipping of audio on count of 1-10. No freezes. Video remained good througout conference. First time stethoscope picked up well enough for pleural rub. Sam, Barry and Holley were present for this conference.
3	8/7/96	15:30	15:45	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Connection with Sam from MCG. On smoother setting, no audio breaks or video freezes. When reset to sharper setting, audio breaking with "static" sound on the line.
3	8/26/96	11:40	11:55	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	First pulse ox did not give pulse reading on either system. Barry here to monitor system. We rebooted and repeated measurement without problem.
3	9/17/96	9:59	10:11	12.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	No remote video. Patty called.
3	9/18/96	10:23	10:35	12.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	No remote video.
3	9/23/96	9:58	10:09	11.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	No remote video on either side initially. After three minutes, client received remote video, but CMS never did.
3	9/24/96	9:40	9:51	11.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Very good connection. Few audio breaks and video freezes.

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
4	7/23/96	10:59	11:04	5.00	Base	Clear	Not Done	Not Done	Yes	Not Done	Not Done	Poor video, fair audio, CMS slow.
4	7/23/96	11:05	11:10	5.00	Base	Clear	Not Done	Not Done	Yes	Not Done	Not Done	Fair audio, poor video, CMS slow
4	7/26/96	10:00	10:20	20.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Good video; audio breaking some. Stethoscope not working at present time. No heart or lung sounds recognizable.
4	7/29/96	9:45	10:00	15.00		Clear						Eleven rings on first attempt. Thirteen on second attempt. Client states she is having a difficult time hearing me. Reported to Sam on 8-1-96. Numerous freezes noted.
4	7/31/96	10:30	10:45	15.00	Base	Clear						There was some freezing; freezes lasted for longer periods of time later during the conference. There is a lot of noise on the system during the time the client is using her thermometer. Reported to Sam on 8-1-96.
4	8/5/96	10:06	10:15	9.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Some freezing and audio is breaking. Volume low on both sides.
4	8/7/96	12:24	12:40	16.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Smoother setting, no audio/video breaks. Audio very low, not hearing a lot of what I'm saying & having hard time pressing yes button to accept call & done button after entering weight. Will check. Suggested using pencil eraser. Barry, Bob & Holly present
4	8/7/96	15:15	15:30	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Connection made with Sam from MCG. Smoother setting, no audio/video breakup. Sharper setting, numerous breakups & freezes. Client having hard time hearing me & having trouble pushing buttons on screen. There were two freezes & several clippings on count.
4	8/12/96	11:05	11:20	15.00	Base	Raining	Yes	Yes	Yes	Yes	Not Done	Connected from MCG with new software on the smoother mode. There was a delay in the audio and not all of her audio came across the system. The video was very good.
4	8/19/96	12:05	12:18	13.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Some freezing and breaks noted.

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
4	8/20/96	11:26	11:55	29.00	Base	Clear	Not Done	Yes	Yes	Not Done	Not Done	Had good video with breaks. System disconnected and we rebooted. Numerous breaks noted in audio and video.
4	9/3/96	10:52	11:02	10.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	Some freezing video and breaking audio, but still understandable.
4	9/4/96	11:05	11:12	7.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	PIC - very good connection. Good audio and video.
4	9/10/96	10:07	10:16	9.00		Cloudy	Yes	Yes	Yes	Yes	Not Done	Freezing and breaking (lag), but quick recovery.
4	9/17/96	9:44	9:52	8.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Freezing and clipping, but quick recovery.
4	9/23/96	10:10	10:23	13.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	No remote video to CMS. Patient had remote video.
4	9/24/96	9:40	10:21	41.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	BP reading did not transfer to CMS. System said "error" while taking BP, ISDN lines dropped. Reconnected without problems and all three channels up. Sam here and aware.
10	8/19/96	11:20	11:25	5.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	Sam here for connections. States patient's system needs something else with the cable. He has spoken with Harry. There was video and audio lag--breaking and freezing when we connected with her this morning.
10	9/23/96	10:29	10:40	11.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	A lot of echoing on the connection. EHC frame remained over remote video on client's system. Remote video on CMS good.
13	9/5/96	10:36	10:53	17.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	PMS: good audio and video CMS: good audio, poor video

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
13	9/5/96	14:06	14:10	4.00	Remote	Cloudy	Yes	Yes	Yes	Yes	Not Done	No video, reported to Jones Intercable.
13	9/13/96	10:34	10:51	17.00	Remote	Partly Clou	Yes	Yes	Yes	Yes	Not Done	CMS not remote video.
13	9/17/96	10:49	10:54	5.00	Remote	Raining	Not Done	Yes	Yes	Not Done	Not Done	CMS unable to see PMS video.
13	9/17/96	12:40	12:54	14.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	
13	9/20/96	8:46	9:01	15.00	Base	Clear	Yes	Yes	Yes	Yes	Yes	
13	9/20/96	9:02	9:05	3.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Yes	
13	9/24/96	9:10	9:25	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
13	9/24/96	12:18	12:30	12.00	Remote	Clear	Not Done	Not Done	Not Done	Not Done	Yes	
13	9/25/96	9:19	9:35	16.00	Remote	Clear	Yes	Yes	Yes	Yes	Not Done	
13	9/27/96	8:58	9:09	11.00	Remote	Partly Clou	Yes	Yes	Yes	Yes	Not Done	

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
13	9/30/96	9:34	9:44	10.00	Base	Raining	Yes	Not Done	Yes	Yes		
13	10/1/96	9:07	9:20	13.00	Base	Raining	Yes	Yes	Yes	Yes	Not Done	
13	10/2/96	9:12	9:23	11.00	Base	Raining	Yes	Yes	Yes	Yes	Not Done	
13	10/4/96	9:33	9:46	13.00	Remote	Cloudy	Yes	Yes	Yes	Not Done	Not Done	
13	10/8/96	8:40	8:51	11.00	Remote	Raining	Yes	Yes	Yes	Yes	Not Done	
13	10/10/96	16:34	16:41	7.00	Remote	Clear	Yes	Yes	Yes	Yes	Not Done	CMS no remote video, PMS good audio.
13	10/11/96	10:27	10:38	11.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
13	10/14/96	11:58	12:09	11.00	Remote	Clear	Yes	Yes	Yes	Yes	Not Done	
14	9/16/96	9:40	9:42	2.00	Base	Partly Clou	Not Done	Not Done	Not Done	Not Done	Not Done	Poor audio
22	6/28/96	14:30	14:40	10.00	Base	Clear	Not Done	Not Done	Yes	Yes	Not Done	

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
22	7/23/96	11:40	11:45	5.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Eight rings before connection made. Audio breaking. No video. Testing system with Sam.
22	7/26/96	10:25	10:33	8.00	Base	Clear	Not Done	Yes	Yes	Not Done	Not Done	Good video and audio. Some static on the line. Some short freezes.
22	7/29/96	9:30	9:44	14.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Good connection. Some freezing, resolving quickly.
22	8/5/96	10:39	10:47	8.00		Clear	Yes	Yes	Yes	Yes	Not Done	There was some freezing. Audio had some breaks.
22	8/7/96	11:36	12:02	26.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Setting on smoother-connection very good. No audio breaks and no video freezing. Setting changed for sharper picture and numerous freezes in video and audio breaks. Connection was at EAMC. Sam, Bob, Barry and Holly were present. Connection #1 of 2.
22	8/7/96	16:00	16:15	15.00	Base	Clear	No	Yes	Yes	Yes	Not Done	This session was a test with Sam from MCG. On the smoother setting, there were no audio or video breakups. On the sharper setting, there were numerous freezes and audio breakups.
22	8/12/96	10:35	10:45	10.00		Raining	Yes	Yes	Yes	Yes	Not Done	Connection from MCG. First time with new software and on smoother mode. Audio and video were very good. No breaks or freezes. Occasional clipping on patient's remote.
22	8/19/96	12:30	12:40	10.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Very good connection. Good video and audio.
22	8/20/96	10:54	11:03	9.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Very good connection. Good audio and video.
22	8/26/96	12:05	12:20	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Very good connection. Good audio and video.

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
22	8/27/96	11:45	11:58	13.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	Very good connection. Good audio and video.
22	9/18/96	11:11	11:24	13.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	System disconnected one time. Reconnected. The temp screen on PMS "jumping off and on." Reported to Sam (here).
24	7/22/96	10:00	10:15	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	A lot of artifact during connection. Clear and hot.
24	7/22/96	14:20	14:27	7.00	Base	Clear	No	Yes	Yes	Not Done	Not Done	Video freeze, peripherals not working, nurse in home.
24	7/29/96	10:00	10:15	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Some freezing.
24	7/31/96	9:40	9:55	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Audio break up, video freezes.
24	8/5/96	10:26	10:37	11.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	On the smoother setting, no audio or video breaks or freezes. When the setting was changed to sharper, there were freezes in the video with more pixels and more audio breaks. There was a static sound on the line at times.
24	8/7/96	9:53	10:11	18.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Connected on smoother setting and had no audio or video problems. Reconnected on sharper setting and had numerous breaks in audio and freezes in video. Sam, Barry, Bob and Holley were present for this connection.
24	8/7/96	15:00	15:15	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	This was a test session with Sam. On the smoother setting, there were no audio breaks or video freezes. On the sharper settings there were long video freezes and audio was quite broken. This connection was from MCG.
24	8/12/96	10:45	11:00	15.00	Base	Raining	Yes	Yes	Yes	Yes	Not Done	Connected from MCG with new software and smoother mode setting. Audio and video better. Some audio freezes, but very short. Few audio breaks.

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
24	8/14/96	12:15	12:30	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Some short freezes and audio clipping. Sam here and adjusted the audio volume for client; resulting in much better audio.
24	8/16/96	8:15	8:45	30.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Patient initiated connection - good audio and video.
24	8/19/96	11:50	12:10	20.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Some freezing and breaking.
24	8/20/96	11:05	11:20	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	System disconnected two times. A lot of frozen segments.
24	8/26/96	11:07	11:27	20.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Good audio and video.
24	9/4/96	10:32	11:04	32.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	Audio freezing for longer periods of time and video breaking up. After BP check, video froze, then system disconnected. Called Mike Burrow at MCG. He said they had dropped an ISDN line, he had reported it. I asked Mrs. Borden to re-boot and reconnected.
24	9/10/96	9:54	10:03	9.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	Good connection. Cloudy.
24	9/11/96	10:32	10:40	8.00	Base	Cloudy	Not Done	Not Done	Not Done	Not Done	Not Done	Connected two times and did not have remote video. Patient saw me clearly. Audio was ok. Called Sam and Barry at MCG - they are coming here to see the system. (Cloudy - 100% humidity).
24	9/18/96	10:02	10:17	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	No local video on CMS side. Patient has remote video.
25	7/18/96	9:50	10:04	14.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	Audio lost when cit attempted to adjust.

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
25	7/19/96	8:45	9:05	20.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	CMS slow. Occasional video freeze.
25	7/19/96	15:15	15:26	11.00	Base	Partly Clou	Not Done	Yes	Yes	Not Done	Not Done	Frequent return video freeze.
25	7/23/96	9:03	9:14	11.00	Base	Clear	No	No	No	No	Not Done	Remote measurements did not transmit to CMS. Good audio and video.
25	7/23/96	9:24	9:27	3.00	Base	Partly Clou	Not Done	Not Done	Yes	Not Done	Not Done	CMS very slow. Good audio and video.
25	7/24/96	8:34	8:50	16.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	CMS very slow. Good audio. Video feeze during remote measurements.
25	7/25/96	9:00	9:10	10.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	
25	7/26/96	9:00	9:10	10.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	
25	7/29/96	9:03	9:12	9.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
25	7/31/96	8:53	8:54	1.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	Good audio, no video.
25	7/31/96	8:55	9:05	10.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	No remote video at CMS. Remote unit okay.

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
25	7/31/96	9:08	9:14	6.00	Remote	Clear	Not Done	Not Done	Yes	Not Done	Not Done	
25	7/31/96	12:00	12:05	5.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	PMS camera came back on this morning. Video window gone.
25	8/1/96	11:07	11:16	9.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
25	8/2/96	9:01	9:12	11.00	Base	Raining	Yes	Yes	Yes	Yes	Not Done	Buzzing in audio during last 30 seconds of call.
25	8/5/96	8:34	8:44	10.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
25	8/6/96	10:11	10:25	14.00	Base	Partly Clou	Yes	Yes	Yes	Not Done	Not Done	
25	8/6/96	10:39	10:43	4.00	Base	Partly Clou	Not Done	Not Done	Yes	Not Done	Not Done	Grainy video. Changed to smooth with minimal loss of clarity.
25	8/7/96	8:40	8:54	14.00	Base	Foggy	Yes	Yes	Yes	Yes	Not Done	
25	8/7/96	15:01	15:04	3.00	Base	Partly Clou	Not Done	Not Done	Not Done	Not Done	Not Done	Cit bumped machine, disconnected with error message.
25	8/7/96	15:08	15:12	4.00	Base	Hot	Not Done	Not Done	Yes	Not Done	Not Done	

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
25	8/8/96	9:08	9:24	16.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	Storm last night. Lost touch screen. Hard reset corrected.
25	8/8/96	15:45	16:00	15.00	Base	Clear	Yes	Not Done	Yes	Not Done	Not Done	
25	8/9/96	8:45	9:01	16.00	Base	Foggy	Yes	Yes	Yes	Yes	Not Done	
25	8/12/96	9:00	9:15	15.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
25	8/13/96	8:40	8:55	15.00	Base	Hot	Yes	Yes	Yes	Yes	Not Done	No remote video display.
25	8/13/96	9:05	9:10	5.00	Base	Partly Clou	Not Done	Not Done	Yes	Not Done	Not Done	Patient reports no local white screen. Unplugged and replugged unit. Call retired.
25	8/13/96	9:20	9:25	5.00	Remote	Foggy	Not Done	Not Done	Yes	Not Done	Not Done	
25	8/14/96	9:15	9:28	13.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
25	8/15/96	9:20	9:35	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
25	8/16/96	9:10	9:20	10.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
25	8/16/96	11:48	11:51	3.00	Remote	Clear	Not Done	Not Done	Yes	Not Done	Not Done	Patient wanted to send off-line measurements.
25	8/19/96	16:15	16:33	18.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
25	8/20/96	8:45	8:48	3.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	PMS reports no video or audio, hung up and rebooted.
25	8/20/96	8:50	9:00	10.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
25	8/20/96	15:55	16:00	5.00	Base	Clear	Not Done	Not Done	Yes	Yes	Not Done	
25	8/21/96	8:29	8:40	11.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
25	8/22/96	9:20	9:40	20.00	Base	Hot	Yes	Yes	Yes	Yes	Not Done	
25	8/26/96	9:50	10:03	13.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
25	8/27/96	13:20	13:30	10.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	
25	8/28/96	13:15	13:27	12.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
25	8/29/96	10:45	10:54	9.00	Base	Foggy	Yes	Yes	Yes	Yes	Not Done	
25	8/30/96	10:30	10:45	15.00	Remote	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
25	9/3/96	13:08	13:15	7.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	
25	9/4/96	11:41	11:50	9.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
25	9/5/96	8:36	8:47	11.00	Remote	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
25	9/5/96	13:49	14:05	16.00	Base	Cloudy	Not Done	Not Done	Not Done	Not Done	Yes	Connected to test the EKG. IT WORKS!!
25	9/6/96	9:00	9:09	9.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
25	9/9/96	11:40	11:48	8.00	Remote	Clear	Yes	Yes	Yes	Yes	Not Done	
25	9/10/96	12:05	12:15	10.00	Remote	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
25	9/11/96	8:59	9:19	20.00	Base	Cloudy	Yes	Yes	Yes	Yes	Yes	

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
25	9/12/96	11:34	11:45	11.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Yes	Patient needs potassium.
25	9/13/96	11:58	12:10	12.00	Remote	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
25	9/16/96	11:30	11:38	8.00	Remote	Raining	Yes	Yes	Yes	Yes	Not Done	
25	9/17/96	11:11	11:35	24.00	Base	Cloudy	Yes	Yes	Yes	Yes	Yes	
25	9/18/96	9:24	9:31	7.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
25	9/19/96	8:30	8:37	7.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	CMS no remote video, PMS good AV.
25	9/19/96	8:37	8:39	2.00	Remote	Clear	Not Done	Not Done	Yes	Not Done	Not Done	CMS: no remote video, PMS: good AV.
25	9/20/96	8:33	8:39	6.00	Remote	Clear	Yes	Yes	Yes	Yes	Not Done	CMS: no remote video, good audio.
25	9/20/96	8:40	8:41	1.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	No remote video at CMS, good audio.
25	9/23/96	9:03	9:05	2.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	No video of patient on either side.

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
25	9/23/96	9:05	9:09	4.00	Remote	Clear	Yes	Yes	Yes	Not Done	Not Done	No video of patient on either side.
25	9/23/96	12:56	13:02	6.00	Remote	Clear	Not Done	Not Done	Yes	Yes	Not Done	
25	9/24/96	13:00	13:10	10.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
25	9/25/96	13:07	13:14	7.00	Remote	Clear	Yes	Yes	Yes	Yes	Not Done	
25	9/26/96	13:06	13:13	7.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
25	9/27/96	9:10	9:18	8.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
25	9/30/96	9:15	9:25	10.00	Base	Raining	Yes	Yes	Yes	Yes	Not Done	
25	10/1/96	10:35	10:49	14.00	Remote	Raining	Yes	Yes	Yes	Yes	Not Done	Increased respiratory difficulty.
25	10/2/96	8:57	8:59	2.00	Base	Raining	Not Done	Not Done	Yes	Yes	Not Done	Patient feels much better after respiratory difficulties yesterday.
25	10/2/96	14:36	14:48	12.00	Remote	Cloudy	Yes	Yes	Yes	Yes	Not Done	

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
25	10/4/96	9:48	9:54	6.00	Base	Clear	Yes	Yes	Yes	Not Done	Not Done	No audio.
25	10/8/96	10:35	10:45	10.00	Base	Raining	Yes	Yes	Yes	Yes	Not Done	
25	10/9/96	8:45	8:53	8.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
25	10/10/96	9:10	9:20	10.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
25	10/11/96	11:18	11:30	12.00	Remote	Clear	Yes	Yes	Yes	Yes	Not Done	
25	10/14/96	11:26	11:34	8.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
33	8/16/96	13:40	14:00	20.00	Base	Clear	Yes	Yes	Yes	Not Done	Not Done	
33	8/19/96	16:48	17:05	17.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	The patient is "fascinated by this."
33	8/20/96	16:10	16:15	5.00	Base	Clear	Not Done	Not Done	Yes	Not Done	Not Done	
33	8/21/96	13:12	13:25	13.00	Base	Clear	Yes	Not Done	Yes	Not Done	Not Done	

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
33	8/22/96	12:50	13:05	15.00	Base	Clear	Yes	Yes	Yes	Yes	Yes	Patient needs larger blood pressure cuff.
33	8/23/96	13:20	14:00	40.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
33	8/26/96	13:40	14:08	28.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
33	8/27/96	13:05	13:20	15.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	
33	8/29/96	11:21	11:42	21.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	Audio break-up for the first five minutes.
33	9/3/96	12:48	13:07	19.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	
33	9/4/96	12:30	12:45	15.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
33	9/10/96	13:57	14:02	5.00	Base	Partly Clou	Not Done	Not Done	Not Done	Not Done	Not Done	Screen read "hospital can not be reached." Patient pressed "ok" button and the call was dropped.
33	9/10/96	14:03	14:24	21.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
33	9/11/96	12:02	12:22	20.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
33	9/12/96	12:15	12:31	16.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
33	9/13/96	13:08	13:20	12.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
33	9/17/96	11:45	12:02	17.00	Remote	Raining	Yes	Yes	Yes	Yes	Not Done	
33	9/20/96	14:40	14:44	4.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	PMS displays "Unable to reach CMS". Disconnected at OK. No touch screen, CMS won't answer, rebooted, all okay.
33	9/20/96	14:45	14:50	5.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
33	9/23/96	18:15	18:20	5.00	Remote	Clear	No	No	No	Not Done	Not Done	Lost touch screen, unable to answer from CMS, rebooted and O.K.
33	9/24/96	14:00	14:10	10.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
33	9/25/96	13:20	13:33	13.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
33	9/26/96	13:20	13:29	9.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
33	9/30/96	12:06	12:19	13.00	Remote	Raining	Yes	Yes	Yes	No	Not Done	No audio on PMS, low volume on CMS.

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
33	10/1/96	12:28	12:36	8.00	Remote	Raining	Yes	Yes	Yes	No	Not Done	No audio.
33	10/2/96	9:29	9:35	6.00	Base	Raining	Not Done	Not Done	Yes	No	Not Done	
33	10/2/96	15:32	15:50	18.00	Remote	Cloudy	Yes	Yes	Yes	Yes	Not Done	PMS: audio problems.
33	10/4/96	13:17	13:23	6.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	No audio for first 3 minutes then okay.
33	10/8/96	11:47	11:59	12.00	Remote	Raining	Yes	Yes	Yes	Yes	Not Done	Audio popping, had to adjust volume for stethoscope.
33	10/9/96	14:02	14:06	4.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	No audio rebooted.
33	10/9/96	14:07	14:19	12.00	Base	Clear	Yes	Not Done	Yes	Not Done	Not Done	PMS: RTE 1077, CMS RTE 3420. Unable to do remote measurements. Good audio.
33	10/11/96	11:40	11:43	3.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	RTE 1077: A subsystem has failed during BP.
33	10/14/96	12:24	12:34	10.00	Remote	Clear	Yes	Yes	Yes	Yes	Not Done	Occasional audio popping.
41	8/29/96	11:00	11:07	7.00	Remote	Partly Clou	Not Done	Yes	Yes	Yes	Not Done	

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
41	9/3/96	12:22	12:31	9.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	
41	9/5/96	9:19	9:31	12.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
41	9/6/96	8:43	8:59	16.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
41	9/10/96	11:34	11:59	25.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
41	9/11/96	11:24	11:38	14.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Yes	
41	9/11/96	11:39	11:40	1.00	Remote	Partly Clou	Not Done	Not Done	Not Done	Not Done	Not Done	Patient just wanted to see if she could call from her equipment.
41	9/16/96	11:18	11:29	11.00	Remote	Raining	Yes	Yes	Yes	Yes	Yes	
41	9/17/96	9:50	10:07	17.00	Remote	Raining	Yes	Yes	Yes	Yes	Yes	
41	9/18/96	10:11	10:24	13.00	Remote	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
41	9/20/96	9:38	9:42	4.00	Base	Clear	No	No	No	No	No	Run-time error 3040: error during read, unable to disconnect; unplugged.
41	9/20/96	9:52	9:55	3.00	Base	Clear	No	No	No	No	Not Done	Run-time error 3040:error during read, unable to disconnect; unplugged.

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
41	9/23/96	9:52	9:55	3.00	Remote	Clear	Yes	Yes	Yes	Not Done	Not Done	Run-time error 3040: error during read, unable to disconnect; unplugged.
41	9/24/96	10:34	10:49	15.00	Remote	Clear	Yes	Yes	Yes	Yes	Not Done	
41	9/26/96	12:54	13:06	12.00	Remote	Clear	Yes	Yes	Yes	Yes	Not Done	
41	9/27/96	8:43	8:46	3.00	Remote	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	PMS disconnected when CMS attempted remote measurements.
41	9/27/96	8:47	8:50	3.00	Base	Partly Clou	No	No	No	No	Not Done	CMS unable to start measurements PMS attempted with Run time error 3420: object is invalid or not set.
41	9/30/96	9:03	9:05	2.00	Base	Raining	Not Done	Not Done	Not Done	Not Done	Not Done	Rebooted PMS/CMS unable to connect. PING timed out.
41	9/30/96	14:30	14:40	10.00	Remote	Raining	Yes	Yes	Yes	Yes	Not Done	
41	10/1/96	12:57	13:12	15.00	Remote	Cloudy	Yes	Yes	Yes	Yes	Not Done	
43	9/17/96	10:55	11:05	10.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	Good connection.
43	9/18/96	10:45	10:57	12.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Good connection.

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
44	9/17/96	11:07	11:15	8.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Taking wife to lunch, did not wish to connect at this time.
44	9/18/96	10:58	11:08	10.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Good connection.
45	9/5/96	11:35	11:44	9.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	Barry & Mike here from GA Tech to watch conference. Tried to connect yesterday morn & loud motor sound in background made it impossible to hear patient. This morning connection was good. There were few audio breaks & video freezes, but recovery was quick
45	9/23/96	10:55	11:05	10.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	After last measurement, ISDN lines dropped and we reconnected without problems.
46	8/27/96	10:15	10:20	5.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	Clear with some video freezing and audio breaks with quick recovery time.
46	8/30/96	12:00	12:05	5.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	Good connections. Few audio breaks and video freezing with quick recovery time.
46	9/10/96	11:20	11:35	15.00	Base	Cloudy	Yes	Yes	Yes	Yes	Not Done	Barry & Mike here from GA Tech to watch conference. I tried to connect yesterday morn & was a motor sound in background, coudn't hear patient talking. This morning connection was good. There were a few audio breaks & video freezes, but quick recovery.
46	9/23/96	10:45	11:00	15.00	Base	Clear	Yes	Yes	Yes	Yes	No	I had no remote video. Call was made after ISDN lines dropped during patient's visit. The lines were up at the time of the conference. Sam and Patty aware.
47	10/2/96	9:42	9:54	12.00	Base	Raining	Not Done	Yes	Yes	Yes	Not Done	

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
47	10/10/96	16:40	16:45	5.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
47	10/11/96	10:59	11:15	16.00	Base	Clear	Yes	Yes	Yes	No	Not Done	CMS unable to hear stethoscope.
53	7/12/96	15:45	16:15	30.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	Touch screen slow.
53	8/13/96	9:35	9:43	8.00	Base	Partly Clou	Not Done	Not Done	Yes	Not Done	Not Done	
53	8/30/96	13:05	13:27	22.00	Base	Partly Clou	Not Done	Not Done	Yes	Not Done	Yes	
53	9/4/96	11:51	11:55	4.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	
53	9/4/96	12:05	12:14	9.00	Remote	Partly Clou	Yes	Yes	Yes	Yes	Not Done	Audio popping occasionally.
53	9/12/96	11:21	11:33	12.00	Base	Partly Clou	Not Done	Yes	Yes	Yes	Not Done	
53	9/16/96	13:15	13:26	11.00	Base	Partly Clou	Yes	Yes	Yes	Yes	Not Done	
55	10/1/96	11:34	11:36	2.00	Base	Cloudy	Not Done	Not Done	Yes	Not Done	Not Done	

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
55	10/4/96	13:00	13:06	6.00	Base	Partly Clou	Not Done	Not Done	Yes	Not Done	Not Done	No audio.
55	10/8/96	9:00	9:03	3.00	Base	Raining	Not Done	Not Done	Yes	Not Done	Not Done	
55	10/11/96	10:44	10:49	5.00	Remote	Clear	Not Done	Not Done	Yes	No	Not Done	
56	9/23/96	14:08	14:15	7.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
56	9/30/96	14:41	14:47	6.00	Base	Raining	Yes	Yes	Yes	Yes	Not Done	
57	9/30/96	11:15	11:20	5.00	Base	Cloudy	Not Done	Yes	Yes	Yes	Not Done	
57	10/2/96	11:00	11:05	5.00	Base	Raining	Not Done	Not Done	Not Done	Not Done	Not Done	Video freeze. Audio break up, black screen message:"data conference only."
57	10/3/96	10:35	10:40	5.00	Base	Cloudy	Not Done	Not Done	Not Done	Not Done	Not Done	Video: freeze frame. Audio: sound breakup.
58	9/19/96	9:55	9:56	1.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	
58	9/24/96	13:24	13:33	9.00	Base	Clear	Not Done	Not Done	Yes	Not Done	Not Done	

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
58	9/25/96	12:41	13:06	25.00	Base	Clear	Not Done	Yes	Yes	Yes	Not Done	
58	9/27/96	9:22	9:27	5.00	Base	Partly Clou	Not Done	Not Done	Not Done	Not Done	Not Done	Run time error 3040 when attempted measurements.
58	10/2/96	11:33	11:38	5.00	Base	Raining	Not Done	No	Yes	Not Done	Not Done	CMS: occasional audio popping PMS: good audio and video.
58	10/2/96	11:45	11:52	7.00	Base	Raining	Yes	Yes	Yes	Yes	Not Done	
58	10/4/96	13:08	13:10	2.00	Base	Partly Clou	Not Done	Not Done	Not Done	Not Done	Not Done	NO AUDIO.
58	10/9/96	8:28	8:42	14.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	Unable to connect.
58	10/10/96	9:20	9:39	19.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	
58	10/11/96	10:00	10:11	11.00	Base	Clear	Not Done	Not Done	Not Done	Not Done	Not Done	Patient not available.
58	10/14/96	11:09	11:16	7.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
59	9/25/96	12:50	12:58	8.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	

Pt_ID	Date	Connect Time	Disconnect Time	Duration	Contact Origination	Weather Conditions	Temperature Probe	Blood Pressure Cuff	Pulse Oximeter	Stethoscope	EKG	Notes
59	10/2/96	11:52	12:03	11.00	Base	Raining	Yes	Yes	Yes	Yes	Not Done	
60	9/25/96	12:59	13:05	6.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
60	10/14/96	11:16	11:24	8.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
67	9/23/96	13:50	14:03	13.00	Base	Clear	Yes	Yes	Yes	Yes	Yes	
67	9/25/96	13:34	13:45	11.00	Base	Clear	Yes	Yes	Yes	Yes	Not Done	
67	9/30/96	13:40	13:55	15.00	Base	Raining	Yes	Yes	Yes	Yes	Not Done	
67	10/8/96	10:45	10:59	14.00	Base	Raining	Yes	Yes	Yes	Yes	Not Done	
67	10/9/96	13:52	14:02	10.00	Remote	Clear	Yes	Yes	Yes	Yes	Not Done	
67	10/14/96	11:35	11:44	9.00	Remote	Clear	Yes	Not Done	Yes	No	Not Done	

DURATION OF SUCCESSFUL CONNECTIONS

Each chart represents an individual patient.

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
1	07/08/96	10.00	12.5187689
1	07/10/96	15.00	
1	07/12/96	10.00	
1	07/15/96	15.00	
1	07/19/96	15.00	
1	07/22/96	20.00	
1	07/29/96	15.00	
1	07/31/96	18.00	
1	08/07/96	13.00	
1	08/12/96	10.00	
1	08/15/96	15.00	
1	08/16/96	9.00	
1	08/16/96	10.00	
1	08/27/96	15.00	
1	08/30/96	11.00	
1	09/05/96	10.00	
1	09/06/96	18.00	
1	09/09/96	2.00	
1	09/09/96	7.00	
1	09/10/96	11.00	
1	09/13/96	20.00	
1	09/18/96	10.00	
1	09/19/96	19.00	
1	09/23/96	5.00	
1	09/25/96	10.00	
1	09/25/96	15.00	
1	09/27/96	10.00	
TOTAL:		338.00676	

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
2	06/19/96	30.00	16.47533
2	06/20/96	12.00	
2	06/21/96	20.00	
2	06/24/96	9.00	
2	06/25/96	42.00	
2	06/26/96	12.00	
2	06/27/96	39.00	
2	06/28/96	11.00	
2	07/01/96	69.00	
2	07/02/96	15.00	
2	07/03/96	10.00	
2	07/09/96	20.00	
2	07/10/96	15.00	
2	07/11/96	15.00	
2	07/12/96	20.00	
2	07/17/96	35.00	
2	07/18/96	15.00	
2	07/19/96	35.00	
2	07/23/96	1.00	
2	07/23/96	5.00	
2	07/23/96	8.00	
2	07/23/96	15.00	
2	07/24/96	10.00	
2	07/25/96	11.00	
2	07/29/96	15.00	
2	07/31/96	8.00	
2	08/05/96	8.00	
2	08/07/96	8.00	
2	08/12/96	12.00	
2	08/19/96	20.00	
2	08/20/96	16.00	
2	08/26/96	23.00	
2	08/27/96	9.00	
2	09/03/96	17.00	
2	09/04/96	8.00	
2	09/10/96	5.00	
2	09/17/96	13.00	
2	09/18/96	9.00	
2	09/23/96	5.00	
2	09/24/96	9.00	

Total: 659.01318

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
3	07/29/96	17.00	13.50023
3	07/31/96	15.00	
[illegible]	08/07/96	15.00	
3	08/26/96	15.00	
3	09/17/96	12.00	
3	09/18/96	12.00	
3	09/23/96	11.00	
3	09/24/96	11.00	
Total:		108.00182	

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
4	07/23/96	5.00	14.70618
4	07/26/96	20.00	
4	07/29/96	15.00	
4	07/31/96	15.00	
4	08/05/96	9.00	
4	08/07/96	15.00	
4	08/07/96	16.00	
4	08/12/96	15.00	
4	08/19/96	13.00	
4	08/20/96	29.00	
4	08/27/96	10.00	
4	09/03/96	10.00	
4	09/04/96	7.00	
4	09/10/96	9.00	
4	09/17/96	8.00	
4	09/23/96	13.00	
4	09/24/96	41.00	
Total:		250.005	

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
10	08/19/96	5.00	8.00016
10	09/23/96	11.00	
Total:		16.00032	

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
13	09/05/96	4.00	11.36865
13	09/05/96	17.00	
13	09/13/96	17.00	
13	09/17/96	5.00	
13	09/17/96	14.00	
13	09/20/96	3.00	
13	09/20/96	15.00	
13	09/24/96	12.00	
13	09/24/96	15.00	
13	09/25/96	16.00	
13	09/27/96	11.00	
13	09/30/96	10.00	
13	10/01/96	13.00	
13	10/02/96	11.00	
13	10/04/96	13.00	
13	10/08/96	11.00	
13	10/10/96	7.00	
13	10/11/96	11.00	
13	10/14/96	11.00	
Total:		216.00432	

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
14	09/16/96	2.00	2.00004
Total:		2.00004	

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
22	07/23/96	5.00	12.16691
22	07/26/96	8.00	
22	07/29/96	14.00	
22	08/05/96	8.00	
22	08/07/96	15.00	
22	08/07/96	26.00	
22	08/12/96	10.00	
22	08/19/96	10.00	
22	08/20/96	9.00	
22	08/26/96	15.00	
22	08/27/96	13.00	
22	09/18/96	13.00	

Total: 146.00292

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
24	07/22/96	7.00	16.17679
24	07/22/96	15.00	
24	07/29/96	15.00	
24	07/31/96	15.00	
24	08/05/96	11.00	
24	08/07/96	15.00	
24	08/07/96	18.00	
24	08/12/96	15.00	
24	08/14/96	15.00	
24	08/16/96	30.00	
24	08/19/96	20.00	
24	08/20/96	15.00	
24	08/26/96	20.00	
24	09/04/96	32.00	
24	09/10/96	9.00	
24	09/11/96	8.00	
24	09/18/96	15.00	
Total:		275.00536	

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
25	7/18/96	14.00	9.8935312
25	7/19/96	11.00	
25	7/19/96	20.00	
25	7/23/96	3.00	
25	7/23/96	11.00	
25	7/24/96	16.00	
25	7/25/96	10.00	
25	7/26/96	10.00	
25	7/29/96	9.00	
25	7/31/96	1.00	
25	7/31/96	5.00	
25	7/31/96	6.00	
25	7/31/96	10.00	
25	8/1/96	9.00	
25	8/2/96	11.00	
25	8/5/96	10.00	
25	8/6/96	4.00	
25	8/6/96	14.00	
25	8/7/96	3.00	
25	8/7/96	4.00	
25	8/7/96	14.00	
25	8/8/96	15.00	
25	8/8/96	16.00	
25	8/9/96	16.00	
25	8/12/96	15.00	
25	8/13/96	5.00	
25	8/13/96	15.00	
25	8/14/96	13.00	
25	8/15/96	15.00	
25	8/16/96	3.00	
25	8/16/96	10.00	
25	8/19/96	18.00	
25	8/20/96	3.00	
25	8/20/96	5.00	
25	8/20/96	10.00	
25	8/21/96	11.00	
25	8/22/96	20.00	
25	8/26/96	13.00	
25	8/27/96	10.00	
25	8/28/96	12.00	
25	8/29/96	9.00	
25	8/30/96	15.00	
25	9/3/96	7.00	
25	9/4/96	9.00	
25	9/5/96	11.00	
25	9/5/96	16.00	
25	9/6/96	9.00	
25	9/9/96	8.00	
25	9/10/96	10.00	
25	9/11/96	20.00	
25	9/12/96	11.00	
25	9/13/96	12.00	
25	9/16/96	8.00	
25	9/17/96	24.00	
25	9/18/96	7.00	

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25	9/19/96	2.00
25	9/19/96	7.00
25	9/20/96	1.00
25	9/20/96	6.00
25	9/23/96	2.00
25	9/23/96	4.00
25	9/24/96	10.00
25	9/25/96	7.00
25	9/26/96	7.00
25	9/27/96	8.00
25	9/30/96	10.00
25	10/1/96	14.00
25	10/2/96	2.00
25	10/2/96	12.00
25	10/4/96	6.00
25	10/8/96	10.00
25	10/9/96	8.00
25	10/10/96	10.00
25	10/11/96	12.00
25	10/14/96	8.00
Total:		742.01484

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
33	8/16/96	20.00	13.2426891
33	8/19/96	17.00	
33	8/20/96	5.00	
33	8/21/96	13.00	
33	8/22/96	15.00	
33	8/23/96	40.00	
33	8/26/96	28.00	
33	8/27/96	15.00	
33	8/29/96	21.00	
33	9/3/96	19.00	
33	9/4/96	15.00	
33	9/10/96	5.00	
33	9/10/96	21.00	
33	9/11/96	20.00	
33	9/12/96	16.00	
33	9/13/96	12.00	
33	9/17/96	17.00	
33	9/20/96	4.00	
33	9/20/96	5.00	
33	9/23/96	5.00	
33	9/24/96	10.00	
33	9/25/96	13.00	
33	9/26/96	9.00	
33	9/30/96	13.00	
33	10/1/96	8.00	
33	10/2/96	6.00	
33	10/2/96	18.00	
33	10/4/96	6.00	
33	10/8/96	12.00	
33	10/9/96	4.00	
33	10/9/96	12.00	
33	10/11/96	3.00	
33	10/14/96	10.00	
Total:		437.00874	

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DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
41	06/28/96	10.00	9.315976
41	07/22/96	2.00	
41	08/29/96	7.00	
41	09/03/96	9.00	
41	09/05/96	12.00	
41	09/06/96	16.00	
41	09/10/96	25.00	
41	09/11/96	1.00	
41	09/11/96	14.00	
41	09/16/96	11.00	
41	09/17/96	17.00	
41	09/18/96	13.00	
41	09/20/96	3.00	
41	09/20/96	4.00	
41	09/23/96	3.00	
41	09/24/96	15.00	
41	09/27/96	3.00	
41	09/30/96	2.00	
41	09/30/96	10.00	
Total:		177.00354	

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
43	09/17/96	10.00	11.00022
43	09/18/96	12.00	
Total:		22.00044	

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
44	09/17/96	8.00	9.00018
44	09/18/96	10.00	
Total:		18.0004	

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
45	09/05/96	9.00	9.50019
45	09/23/96	10.00	
Total:		19.00038	

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
46	08/27/96	5.00	10.0002
46	08/30/96	5.00	
46	09/10/96	15.00	
46	09/23/96	15.00	
Total:		40.0008	

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
47	10/02/96	12.00	11.00014
47	10/10/96	5.00	
47	10/11/96	16.00	

Total: 33.00042

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
53	07/12/96	30.00	13.71447
53	08/13/96	8.00	
53	08/30/96	22.00	
53	09/04/96	4.00	
53	09/04/96	9.00	
53	09/12/96	12.00	
53	09/16/96	11.00	
Total:		96.00132	

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
55	10/01/96	2.00	4.00008
55	10/04/96	6.00	
55	10/08/96	3.00	
55	10/11/96	5.00	

Total: 16.00032

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
56	09/23/96	7.00	6.50013
56	09/30/96	6.00	
Total:		13.00026	

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
57	09/30/96	5.00	5.0001
57	10/02/96	5.00	
57	10/03/96	5.00	

Total: 15.0003

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
58	09/19/96	1.00	8.00016
58	09/24/96	9.00	
58	09/27/96	5.00	
58	10/02/96	5.00	
58	10/02/96	7.00	
58	10/04/96	2.00	
58	10/09/96	14.00	
58	10/10/96	19.00	
58	10/11/96	11.00	
58	10/14/96	7.00	
Total:		80.0016	

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
59	09/25/96	8.00	9.50019
59	10/02/96	11.00	
Total:		19.00038	

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
60	10/14/96	8.00	8.00016
Total:		8.00016	

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DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
67	09/23/96	13.00	11.83357
67	09/25/96	11.00	
67	09/30/96	15.00	
67	10/08/96	14.00	
67	10/09/96	9.00	
67	10/14/96	9.00	
Total:		71.00142	

DURATION OF SUCCESSFUL CONNECTIONS

This chart represents an aggregate of all patients.

DURATION OF SUCCESSFUL CONNECTIONS

Patient ID	Date	Duration	Mean
1	07/08/96	10.00	12.00024
1	07/10/96	15.00	
1	07/12/96	10.00	
1	07/15/96	15.00	
1	07/19/96	15.00	
1	07/22/96	20.00	
1	07/29/96	15.00	
1	07/31/96	18.00	
1	08/07/96	13.00	
1	08/12/96	10.00	
1	08/15/96	15.00	
1	08/16/96	9.00	
1	08/16/96	10.00	
1	08/27/96	15.00	
1	08/30/96	11.00	
1	09/05/96	10.00	
1	09/06/96	18.00	
1	09/09/96	2.00	
1	09/09/96	7.00	
1	09/10/96	11.00	
1	09/13/96	20.00	
1	09/18/96	10.00	
1	09/19/96	19.00	
1	09/23/96	5.00	
1	09/25/96	10.00	
1	09/25/96	15.00	
1	09/27/96	10.00	
2	06/19/96	30.00	
2	06/20/96	12.00	
2	06/21/96	20.00	
2	06/24/96	9.00	
2	06/25/96	42.00	
2	06/26/96	12.00	
2	06/27/96	39.00	
2	06/28/96	11.00	
2	07/01/96	69.00	
2	07/02/96	15.00	
2	07/03/96	10.00	
2	07/09/96	20.00	
2	07/10/96	15.00	
2	07/11/96	15.00	
2	07/12/96	20.00	
2	07/17/96	35.00	
2	07/18/96	15.00	
2	07/19/96	35.00	
2	07/23/96	1.00	
2	07/23/96	5.00	
2	07/23/96	8.00	
2	07/23/96	15.00	
2	07/24/96	10.00	
2	07/25/96	11.00	
2	07/29/96	15.00	
2	07/31/96	8.00	
2	08/05/96	8.00	

DURATION OF SUCCESSFUL CONNECTIONS

2	08/07/96	8.00
2	08/12/96	12.00
2	08/19/96	20.00
2	08/20/96	16.00
2	08/26/96	23.00
2	08/27/96	9.00
2	09/03/96	17.00
2	09/04/96	8.00
2	09/10/96	5.00
2	09/17/96	13.00
2	09/18/96	9.00
2	09/23/96	5.00
2	09/24/96	9.00
3	07/29/96	17.00
3	07/31/96	15.00
3	08/07/96	15.00
3	08/26/96	15.00
3	09/17/96	12.00
3	09/18/96	12.00
3	09/23/96	11.00
3	09/24/96	11.00
4	07/23/96	5.00
4	07/26/96	20.00
4	07/29/96	15.00
4	07/31/96	15.00
4	08/05/96	9.00
4	08/07/96	15.00
4	08/07/96	16.00
4	08/12/96	15.00
4	08/19/96	13.00
4	08/20/96	29.00
4	08/27/96	10.00
4	09/03/96	10.00
4	09/04/96	7.00
4	09/10/96	9.00
4	09/17/96	8.00
4	09/23/96	13.00
4	09/24/96	41.00
10	08/19/96	5.00
10	09/23/96	11.00
13	09/05/96	4.00
13	09/05/96	17.00
13	09/13/96	17.00
13	09/17/96	5.00
13	09/17/96	14.00
13	09/20/96	3.00
13	09/20/96	15.00
13	09/24/96	12.00
13	09/24/96	15.00
13	09/25/96	16.00
13	09/27/96	11.00
13	09/30/96	10.00
13	10/01/96	13.00
13	10/02/96	11.00
13	10/04/96	13.00
13	10/08/96	11.00

13	10/10/96	7.00
13	10/11/96	11.00
13	10/14/96	11.00
14	09/16/96	2.00
22	07/23/96	5.00
22	07/26/96	8.00
22	07/29/96	14.00
22	08/05/96	8.00
22	08/07/96	15.00
22	08/07/96	26.00
22	08/12/96	10.00
22	08/19/96	10.00
22	08/20/96	9.00
22	08/26/96	15.00
22	08/27/96	13.00
22	09/18/96	13.00
24	07/22/96	7.00
24	07/22/96	15.00
24	07/29/96	15.00
24	07/31/96	15.00
24	08/05/96	11.00
24	08/07/96	15.00
24	08/07/96	18.00
24	08/12/96	15.00
24	08/14/96	15.00
24	08/16/96	30.00
24	08/19/96	20.00
24	08/20/96	15.00
24	08/26/96	20.00
24	09/04/96	32.00
24	09/10/96	9.00
24	09/11/96	8.00
24	09/18/96	15.00
25	07/18/96	14.00
25	07/19/96	11.00
25	07/19/96	20.00
25	07/23/96	3.00
25	07/23/96	11.00
25	07/24/96	16.00
25	07/25/96	10.00
25	07/26/96	10.00
25	07/29/96	9.00
25	07/31/96	1.00
25	07/31/96	5.00
25	07/31/96	6.00
25	07/31/96	10.00
25	08/01/96	9.00
25	08/02/96	11.00
25	08/05/96	10.00
25	08/06/96	4.00
25	08/06/96	14.00
25	08/07/96	3.00
25	08/07/96	4.00
25	08/07/96	14.00
25	08/08/96	15.00
25	08/08/96	16.00

DURATION OF SUCCESSFUL CONNECTIONS

25	08/09/96	16.00
25	08/12/96	15.00
25	08/13/96	5.00
25	08/13/96	15.00
25	08/14/96	13.00
25	08/15/96	15.00
25	08/16/96	3.00
25	08/16/96	10.00
25	08/19/96	18.00
25	08/20/96	3.00
25	08/20/96	5.00
25	08/20/96	10.00
25	08/21/96	11.00
25	08/22/96	20.00
25	08/26/96	13.00
25	08/27/96	10.00
25	08/28/96	12.00
25	08/29/96	9.00
25	08/30/96	15.00
25	09/03/96	7.00
25	09/04/96	9.00
25	09/05/96	11.00
25	09/05/96	16.00
25	09/06/96	9.00
25	09/09/96	8.00
25	09/10/96	10.00
25	09/11/96	20.00
25	09/12/96	11.00
25	09/13/96	12.00
25	09/16/96	8.00
25	09/17/96	24.00
25	09/18/96	7.00
25	09/19/96	2.00
25	09/19/96	7.00
25	09/20/96	1.00
25	09/20/96	6.00
25	09/23/96	2.00
25	09/23/96	4.00
25	09/24/96	10.00
25	09/25/96	7.00
25	09/26/96	7.00
25	09/27/96	8.00
25	09/30/96	10.00
25	10/01/96	14.00
25	10/02/96	2.00
25	10/02/96	12.00
25	10/04/96	6.00
25	10/08/96	10.00
25	10/09/96	8.00
25	10/10/96	10.00
25	10/11/96	12.00
25	10/14/96	8.00
33	08/16/96	20.00
33	08/19/96	17.00
33	08/20/96	5.00
33	08/21/96	13.00

33	08/22/96	15.00
33	08/23/96	40.00
33	08/26/96	28.00
33	08/27/96	15.00
33	08/29/96	21.00
33	09/03/96	19.00
33	09/04/96	15.00
33	09/10/96	5.00
33	09/10/96	21.00
33	09/11/96	20.00
33	09/12/96	16.00
33	09/13/96	12.00
33	09/17/96	17.00
33	09/20/96	4.00
33	09/20/96	5.00
33	09/23/96	5.00
33	09/24/96	10.00
33	09/25/96	13.00
33	09/26/96	9.00
33	09/30/96	13.00
33	10/01/96	8.00
33	10/02/96	6.00
33	10/02/96	18.00
33	10/04/96	6.00
33	10/08/96	12.00
33	10/09/96	4.00
33	10/09/96	12.00
33	10/11/96	3.00
33	10/14/96	10.00
41	06/28/96	10.00
41	07/22/96	2.00
41	08/29/96	7.00
41	09/03/96	9.00
41	09/05/96	12.00
41	09/06/96	16.00
41	09/10/96	25.00
41	09/11/96	1.00
41	09/11/96	14.00
41	09/16/96	11.00
41	09/17/96	17.00
41	09/18/96	13.00
41	09/20/96	3.00
41	09/20/96	4.00
41	09/23/96	3.00
41	09/24/96	15.00
41	09/27/96	3.00
41	09/30/96	2.00
41	09/30/96	10.00
43	09/17/96	10.00
43	09/18/96	12.00
44	09/17/96	8.00
44	09/18/96	10.00
45	09/05/96	9.00
45	09/23/96	10.00
46	08/27/96	5.00
46	08/30/96	5.00

46	09/10/96	15.00
46	09/23/96	15.00
47	10/02/96	12.00
47	10/10/96	5.00
47	10/11/96	16.00
53	07/12/96	30.00
53	08/13/96	8.00
53	08/30/96	22.00
53	09/04/96	4.00
53	09/04/96	9.00
53	09/12/96	12.00
53	09/16/96	11.00
55	10/01/96	2.00
55	10/04/96	6.00
55	10/08/96	3.00
55	10/11/96	5.00
56	09/23/96	7.00
56	09/30/96	6.00
57	09/30/96	5.00
57	10/02/96	5.00
57	10/03/96	5.00
58	09/19/96	1.00
58	09/24/96	9.00
58	09/27/96	5.00
58	10/02/96	5.00
58	10/02/96	7.00
58	10/04/96	2.00
58	10/09/96	14.00
58	10/10/96	19.00
58	10/11/96	11.00
58	10/14/96	7.00
59	09/25/96	8.00
59	10/02/96	11.00
60	10/14/96	8.00
67	09/23/96	13.00
67	09/25/96	11.00
67	09/30/96	15.00
67	10/08/96	14.00
67	10/09/96	9.00
67	10/14/96	9.00
Total:		3816.08

ATTEMPTED AND SUCCESSFUL CONNECTION DATA

Patient ID	Number of Days Equipment in Home	Attempted Connections	Successful Connections No Problems
1	230.00	39.00	26.00
2	230.00	44.00	3.00
3	178.00	19.00	1.00
4	178.00	20.00	1.00
10	56.00	14.00	
13	60.00	33.00	14.00
22	83.00	23.00	7.00
24	104.00	24.00	4.00
25	89.00	80.00	54.00
33	60.00	38.00	20.00
41	55.00	23.00	14.00
43	54.00	7.00	2.00
44	54.00	7.00	2.00
45	55.00	9.00	1.00
46	55.00	11.00	
47	14.00	3.00	2.00
50	1.00	*	
53	96.00	8.00	5.00
55	14.00	5.00	2.00
56	89.00	2.00	2.00
57	230.00	7.00	2.00
58	96.00	15.00	6.00
59	96.00	2.00	2.00
60	96.00	2.00	2.00
67	89.00	6.00	6.00
Total days:	2,362.00	441.00	152.00
Mean:	94.48	17.64	6.91

* Patient undergoing training on system use.

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APPENDIX H

Bibliography of Related Publications and Presentations

Burrow, M., "Electronic House Calls: Technological Requirements and Available Alternatives". Presentation at "Telemedicine 2000" Conference. Chicago, IL. June 1996.

Peifer, J., "Electronic House Calls: Demonstration of the System". Interactive Demonstration at the American Academy of Ophthalmology Conference. Chicago, IL. October 1996.

Schlachta, L., and Blakeslee, B., "Telenursing" Presentation at the "Telenursing And Informatics Conference". North Georgia College. Dahlongo, GA. April 1996.

Schlachta, L., "Telemedicine in Mental Health". Presentation to Community Mental Health Group. Fort Gordon, GA. May 1996.

Schlachta, L., "Surfing the Net with American Journal of Nursing". Telenursing Presentation. Las Vegas, NA. June 2, 1996.

Schlachta, L., Demonstration of Electronic Housecall Equipment to Gwendolyn Bell, MD - Director of Child and Adolescent Services, Children's Medical Services, Atlanta,GA. Eisenhower Army Medical Center, Fort Gordon, GA. June, 1996.

Schlachta, L., "Telenursing" Presentation at "Telemedicine 2000 Conference". Chicago, IL. June 1996

Schlachta, L., "Electronic Housecalls". Presentation at "TeleHomeCare Conference". Chicago, IL. June 1996.

Schlachta, L., "The Future of Nursing". Presentation at "Tricare Regional Conference". Jekyll Island, GA. June 1996.

Schlachta, L., Demonstration of Electronic Housecall Equipment to VIPs: Admiral Koenig, Navy Surgeon General, BG Parker - Deputy to Army Surgeon General, and Capt. Tibbets C/O US Navy. Eisenhower Army Medical Center, Fort Gordon, GA. August 1996.

Schlachta, L., "Telenursing" Presentation at "87th Regional Support Command Reserve Conference". Independence City, MO. September 1996.

Schlachta, L., Demonstration of Electronic Housecall Equipment to General (Ret) Gordon R. Sullivan and VIP party. Eisenhower Army Medical Center, Fort Gordon, GA. September 1996.

Toler, J., Burrow,M., Peifer, J., Stachura, M., Searle, J.R., Adams, L.N., Grigsby, K., Schlachta, L., Horner, J., & Colwell, V. "The Electronic Housecall: A Telemedical Approach for Delivering Medical Care to Patients in Their Homes". Poster presentation at "National Forum II: Global Telemedicine and Its International Implications" sponsored by Association of the United States Army (AUSA), the United States Army Medical Research and Materiel Command, and Georgetown University Medical Center. Tysons Corner, Virginia. April 1996.

Publication:

Schlachta, L. "Telemedicine Expands the Scope of Nursing". Accepted for Publication Oct. 1996 Issue of <u>Telemedicine and Telehealth Networks</u> EHC mentioned as part.

Toler,J., Demonstration of Electronic Housecall System. Interactive Demonstration at Second Annual Georgia Statewide Telemedicine Program Conference. Macon, GA. August 1996.

APPENDIX I

Linking GSTP Beyond GSAMS to the Personal Computer

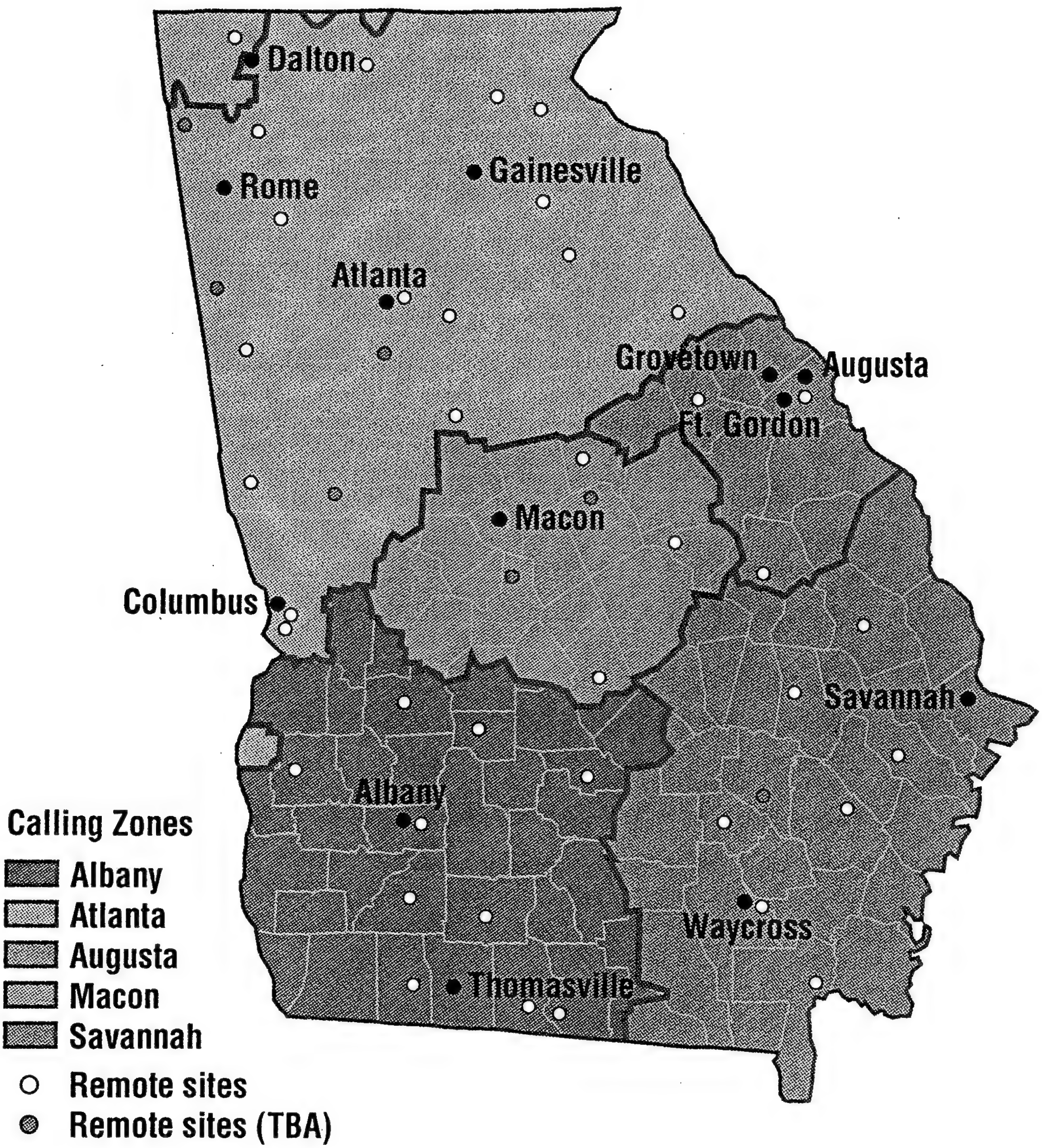
The Georgia Statewide Academic and Medical System (GSAMS) is a wide area switched communication network providing T-1 service currently to 41 Georgia Statewide Telemedicine Program (GSTP) sites and fractional T-1 service to approximately 350 distance learning sites within the State of Georgia. The Georgia Department of Administrative Services (DOAS) designed the network, manages it use, and subcontracts with private long distance and local exchange carriers for installation, carrier service, maintenance, and scheduled connections. Telemedicine and distance learning sites contract with DOAS for the installation, maintenance, and recurring costs of both equipment and communications. The GSAMS network is partitioned so that facilities linking telemedicine sites are not available to the distance learning scheduler. Within LATA boundaries (Figure 1), any site may connect with any other site at any time. Connections which cross LATA boundaries are generally constrained since, at the present time, DOAS leases one interLATA link to each LATA outside the Atlanta LATA.

BellSouth, the local exchange carrier serving most of the telemedicine sites, also provides multipoint service. This allows as many as eight sites to connect simultaneously at 768 Kbps using the FCIF video conferencing standard format. In this mode, diagnostic audio, camera control, and the exchange of still images with interactive annotation are not possible because the video conferencing standards do not support the in-band data channels provided by the proprietary format used in point-to-point telemedicine encounters. The quality of the compressed video is also reduced because the data rate is one-half that used for telemedicine. Nevertheless, the interactive collaboration of many sites is valuable for administrative meetings, continuing education, and training.

For a GSTP member site such as Eisenhower Army Medical Center to communicate with a non-member site, three issues must be resolved: the communication pathway, the communication rate, and the coding format. DOAS provides a bridge between the GSAMS network and the public switched telephone network (PSTN) via a switched-56 inverse multiplexor. This allows any site which has access to switched-56 or ISDN facilities to dial connect with the GSAMS inverse multiplexor with up to 6 circuits (telephone numbers) for a data rate of between 56 Kbps and 336 Kbps. DOAS also provides two codecs, one connected to the inverse multiplexor and the other connected to the GSAMS network at 768 Kbps. The analog audio and video signals are interconnected between the two codecs. This arrangement allows for differences in rate as well as coding algorithms between the GSAMS site and the PSTN site. Any PC based video conferencing system that uses the FCIF (H.320) video conferencing standard and has either an ISDN communication interface or a serial interface such as X.21 linked to an inverse multiplexor, can connect.

The Medical College of Georgia (MCG) Telemedicine Center has purchased an inverse multiplexor for use in the laboratory to develop a direct digital gateway between GSAMS and switched-56. In Phase II development, plans call for the installation of an ISDN-Pri line in the laboratory to provide a PSTN equivalent to T-1 for further evaluation of universal access to GSAMS sites by personal computer based systems such as the Electronic House Call. MCG is also working with DOAS and Georgia Tech to define a packet switched network using ATM technology to replace the current private circuit switched network. Such a change would greatly simplify scheduling, contention for network resources, and allow continuous low-bandwidth communications for access to the central GSTP administrative database, email, and other uses.

Local Access Transport Areas (LATA)



APPENDIX J

Office of Grants and Contracts
NOTICE OF EXTRAMURAL FUNDING

DATE: November 5, 1996

TO: **Principal Investigator:** Max Stachura

Department Chairman/Unit Director: Max Stachura

Vice President/Dean: Darrell Kirch

Sponsored Projects: Mike Wren

Title of Award: A Dual Use Telecommunications System for Delivering Medical Care (Southeast Region Telemedicine Testbed)

Grantor: U.S. Army

Grant/Protocol Number: DAMD17-95-2-5020

Account Number: 11-16-04-1655-40

Budget Period: 06/30/95 - 11/15/96

BUDGET:

Personnel Costs:	214,206	Contractual: (GIT)	536,391
Consultants:	10,200	Contractual:(DDEAMC)	39,072
Equipment:	0	Operations	24,985
Supplies:	0	Other:	0
Travel:	4,587	**TOTAL DIRECT:**	829,441
IDC Rate:	10.5%	**Indirect:**	87,246
		TOTAL:	916,687

Special Provisions: Note changes: P.I. change from Sanders to Stachura; extension of project end date; revised budget categories.

Type of Award: () New () Continuation () Supplement () Transfer (X) Revision ( ) Renewal (X) Extension

		GRA-EHC		
		10-10-04-1658-00		
		June 23, 1996		
	APPROVED	ENCUMBRANCES	EXPENDITURES	
DESCRIPTION	BUDGET	AS OF 6/23/96	AS OF 6/23/96	BALANCE
Personal Services	0.00	0.00	0.00	0.00
Travel	0.00	0.00	0.00	0.00
Supplies	562,500.00	0.00	(711,072.65)	(148,572.65)
Equipment	387,500.00	(203,865.08)	(35,513.89)	148,121.03
TOTAL	950,000.00	(203,865.08)	(746,586.54)	(451.62)

ICTF - H&C
19-20-08-6925-00
Electronic House Call

DESCRIPTION	APPROVED BUDGET	ENCUMBRANCE AS OF 03/19/96	EXPENSES AS OF 03/19/96	BALANCE
Personal Services	128.803.07	(10,071.46)	(118,721.61)	0
Travel	0	0	0	0
Supplies	3,141.00	0	3,140.97	0.03
Equipment	118,066.93	128,280.00		(10,213.07)
TOTAL	250,001.00	(10,071.46)	(250,142.58)	(10,213.04)

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APPENDIX K

Personnel List

Personnel receiving pay from Cooperative Agreement DAMD17-95-2-5020: For the Period 6/30/95 through 9/30/96

TASK CATEGORY	INSTITUTION	NAME	TITLE	% EFFORT & NUMBER OF MONTHS
Administration / Operations	MCG	L. Adams	Director of Operations	.50 x 6
Administration / Operations	MCG	L. Adams	Director of Operations	.40 x 6
Administration / Operations	MCG	L. Adams	Director of Operations	.20 x 3
Clinical	MCG	W. Andrews	Nurse	.15 x 10
Clinical	EAMC	J. Barnes	Nurse / Contractual	.85 x 6
Research & Evaluation	MCG	R. Bashshur	Consultant / Contractual	.22 x 15
Administration / Operations	MCG	A. Brown	Project Manager / Research Coordinator	.50 x 15
Clinical	MCG	C. Cowan	Nurse	.15 x 5
Clinical	MCG	D. Durham	Nurse / Contractual	.85 x 3
Administrative Support	MCG	P. Edwards	Administrative Specialist I	.50 x 2
Research & Evaluation	MCG	K. Grigsby	Director of Research & Development	.20 x 12
Research & Evaluation	MCG	K. Grigsby	Director of Research & Development	.40 x 3
Clinical	MCG	L. Guill	Physician	.07 x 12
Clinical	MCG	T. Jackson	Physician	.10 x 12
Clinical	MCG	T. Jackson	Physician	.15 x 3

TASK CATEGORY	INSTITUTION	NAME	TITLE	% EFFORT & NUMBER OF MONTHS
Research & Evaluation	MCG	J. McCarthy	Consultant / Contractual	$6775 for 3 months
Technical	GIT	S. Panchal	Research Engineer / Contractual	.44 x 9
Clinical	MCG	D. Rahn	Vice Dean / Physician	.04 x 12
Principal Investigator	MCG	J. Sanders	Eminent Scholar/Dir of Telemedicine Center/ Physician	.02 x 2
Technical	MCG	J. Searle	Technical Director	.10 x 12
Technical	MCG	J. Searle	Technical Director	.40 x 3
Principal Investigator	MCG	M. Stachura	Clinical Director / Interim Telemedicine Center Director / Physician	.40 x 13
Administrative & Hardware	GIT	J. Toler	Director	.80 x 15
Software	GIT	J. Peifer	Sr. Research Scientist	.44 x 15
Hardware & Network	GIT	M. Burrow	Sr. Research Scientist	.14 x 3
Hardware & Software	GIT	B. Sudduth	Research Engineer	.76 x 11
Hardware & Software	GIT	A. Hopper	Research Engineer	.54 x 9
Hardware & Software	GIT	S. Panchel	Research Engineer	.56 x 9
Assembly	GIT	G. Matthews	Graduate Research Asst.	.09 x 2
Assembly	GIT	J. Dugger	Graduate Research Asst.	.09 x 2
Clinical	GIT	P. Kennedy, M.D.	Sr. Research Scientist	.09 x 2

Personnel List

Personnel funded by MCG for Cooperative Agreement DAMD17-95-2-5020: For the Period 6/30/95 through 6/30/96

TASK CATEGORY	INSTITUTION	NAME	TITLE	% EFFORT & NUMBER OF MONTHS
Administration / Operations	MCG	L. Adams	Director of Operations	.20 x 6
Administration / Operations	MCG	L. Adams	Director of Operations	.16 x 6
Clinical	MCG	B. Davis	Physician	.09 x 12
Research & Evaluation	MCG	K. Grigsby	Director of Research & Development	.20 x 12
Clinical	MCG	R. Louard	Physician	.05 x 12
Clinical	MCG	G. Mensah	Physician	.12 x 12
Clinical	MCG	D. Rahn	Vice Dean / Physician	.08 x 12
Administrative Support	MCG	D. Rayner	Administrative Specialist IV	.05 x 12
Technical	MCG	J. Searle	Technical Director	.30 x 12